ELECTRICAL REVIEW

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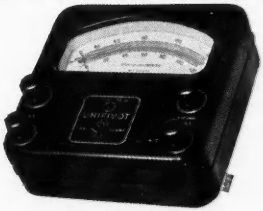

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ELECTRICAL REVIEW

31st OCTOBER, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3910

Economy in Distribution

PRESENT restrictions of capital expenditure to new work that is essential for immediate requirements need especial consideration in their application to the distribution of electricity. One aspect is the times that elapse between the planning of an electrical system, the manufacture of material and the completion of constructional work. During this period the load is growing at a rate that may, on an average, double the demand within ten years or so. The tendency, therefore, is for short-term needs to shade off into long-term projects, unless an extravagant price is later to be paid for meeting the needs of the moment. A far better alternative to skimping designs and abandoning the interests of the future is to go ahead on sound engineering lines and to see how far the savings desired can be made by overhauling existing practice. Nowadays statistical and other information is available in regard to risks which may reasonably be taken without serious consequences to consumers. Many safeguards of security of supply (e.g., making " doubly sure ") persist, the merits of which experience has shown to be illusory. Others are more appropriate to the days of isolated operation and in connection with apparatus (e.g., cables and transformers) once of less proven reliability. The desire to play for safety is natural but it is insidious in its effects and the methods adopted to further it have not always been wise or worth while.

In assessing the value of any accessory, the method of approach is all important. That used by Mr. L. J. Bamber in his lecture to the E.P.E.A. London Technical Group earlier this week (reported in this issue) expressed succinctly what this approach should be: the question is not " how much can be cut out " but " how much is really needed." If the problem is tackled with this freshness of viewpoint, great savings would undoubtedly follow, as several examples given by the lecturer showed. In all of these the cost of switchgear, with which system protection is intimately associated, is a

major factor largely governing the economic layout of a distribution network. Layout is, however, only one aspect. Of comparable importance in its effects on saving is the acceptance of manufacturers' standard designs without "frills," which however good in themselves are rarely worth the extra cost, the delays in production and the use of a scarce type of technical manpower they entail. To secure distribution economy in all its facets is only another case of the long established function of the engineer—to utilize the resources of nature at the least cost.

DUNSTON "B"

The first year's performance of the reheat boiler-turbine unit set at Dunston "B2" power station described by Messrs. A. Howell and J. B. Jackson at the joint meeting of the Institutions of Electrical and Mechanical Engineers last Friday justifies expectations of a notable advance in generation in the near future. Further economies should be obtainable from the greater kW ratings and higher steam conditions projected for new stations in addition to those from the reheating and unitary arrangement. The subsequent discussion indicated appreciation of the value of the explanations given for losses of operating time. The high availability no doubt owed much to the training of the operating crews, which enabled them to cope successfully with various difficulties, including the use of coal of widely varying characteristics.

POOR COAL

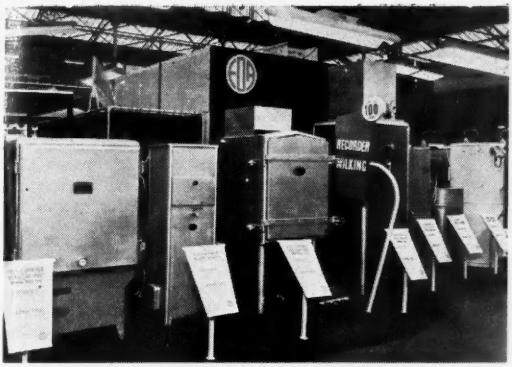
One telling argument for the use of electricity is its production largely from coal of inferior quality. Before the war about 88 per cent of the coal used in British power stations was in the form of treated or untreated "smalls." By 1950 the proportion had risen to over 91 per cent; untreated smalls alone accounted for 64 per cent. At the same time the dry ash content rose from 1·14 to 14·9 per cent while the calorific value fell from 11,520 to 10,930 B.Th.U./lb. Present trends in the mining industry show clearly that the relative proportions of small and poor-quality coal are likely to go on increasing with the greater use of mechanical methods and the working of the poorer seams. If all this inferior product is to be used the co-operation of the electricity supply industry and electricity consumers is imperative.

ENGINEERING AS AN ART

A reminder that the possession of high academic qualifications is not enough by itself to make an engineer was given by Sir David Pye in his presidential address to the Institution of Mechanical Engineers. The purpose of the form of education entailed in achieving such distinction is to develop natural aptitude to devise and construct through an intelligent mental grasp of essentials and the exercise of initiative in applying knowledge to practical ends. This ability is found in engineers of all grades, even when without the great advantage of training on orthodox lines, and should be recognized and encouraged.

A.S.E.E. EXHIBITION

We are pleased to see that in referring to its exhibition next March in its official journal the Association of Supervising Electrical Engineers has dropped the term "national." The decision is wise because many people in the industry considered the claim that this was a National Electrical Engineers' Exhibition to be too ambitious, if not unintentionally misleading. It is still the hope of the industry that a fully representative public electrical exhibition will be possible in the not-too-distant future. In the meantime the A.S.E.E. display provides a good opportunity for electrical manufacturers to show members of other branches of the industry what they have to offer in the way of installation and utilization equipment.



Dairy Farming

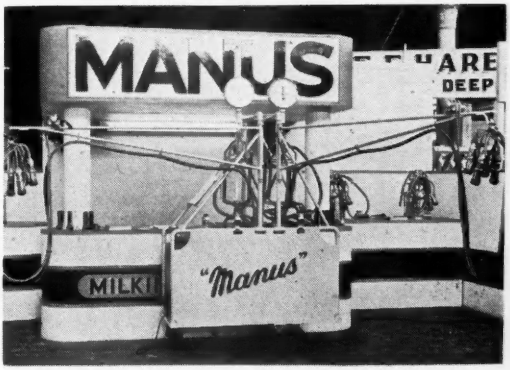
Growing Appreciation of Electrical Methods

THE increasing reliance of farmers on electrical aids in all branches of their work was clearly demonstrated at the sixty-eighth annual Dairy Show held by the British Dairy Farmers' Association at Olympia, London, last week. The part played by electricity in the production of milk under the most labour-saving and hygienic conditions was particularly well emphasized throughout the exhibition and formed the main theme of the display on the Electrical Development Association's stand.

Here could be seen a selection of electrical equipment designed to cater for the steam and hot water requirements of all classes of milk producers. The latest dairy steam raisers and water heaters capable of meeting the demands of clean milk production for both large and small producers ranged from self-contained units for small hand-milked herds to large capacity thermal storage units for multi-point recorder-milked herds. With this display was an exhibit illustrating the advantages of the latest farm wiring system which is capable of withstanding the severe conditions due to fumes and moisture present in stables and cow byres and also lends itself to rapid installation and extension.

There is apparently a strong tendency to adopt in-churn milking and cooling and most manufacturers make a feature of equipment designed for this purpose. The Simplex Dairy Equipment Co., Ltd., now has in-churn milking available not only for normal methods in cowsheds and milking parlours but also for suspension from overhead runway tracks. Mobile milkers too appear to be gaining in popularity and Manus (Gt. Britain), Ltd., showed two new two-point units, one a recorder model.

Among a comprehensive display of milking equipment, which included a new oil-less vacuum pump, the Alfa-Laval Co., Ltd., re-introduced an in-churn cooler. A variation of the Gascoigne "Rotor-freeze" in-churn cooler, the "Rockerlac," is arranged so that the tubes rock backwards and forwards to give the mixing motion. Completing the Gascoigne range of in-churn equipment is a vacuum-operated bottle filler. An improved churn



Above: **A selection of electrical appliances shown by E.D.A. for providing steam and hot water for the dairy farmer.** *Right:* **Manus 2-point mobile milk recorder**

lifting device is now provided for the Purlac cooler which is claimed to cool three churns to below 50 deg F in ten minutes and cold store four churns. For economical operation, particularly when water supplies are limited, the chilled water type of milk coolers have much to recommend them. The compact new "Prestcold" C.W.150 model utilizes the "ice bank" principle giving high milk cooling capacity with a comparatively small refrigeration unit. The water is recirculated and operation is fully automatic.

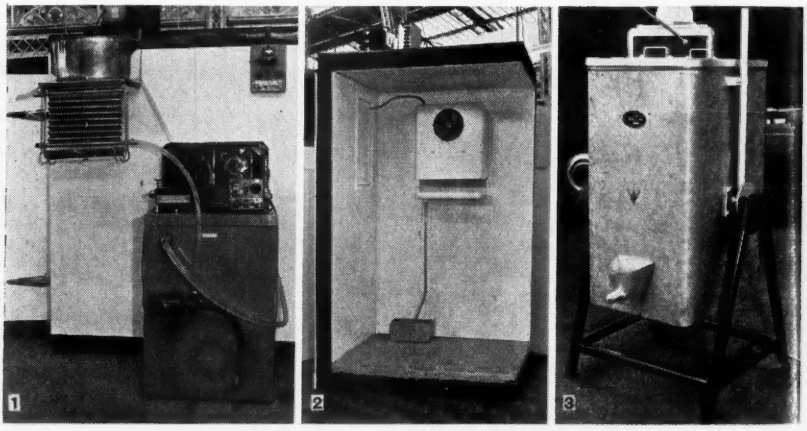
The application of hermetically sealed refrigeration units has now been extended by L. Sterne & Co., Ltd., to cover not only milk coolers but also cold rooms up to 40 cu ft capacity, a complete range of units being available from $\frac{1}{8}$ to $\frac{1}{3}$ h.p. Other recent Sterne developments include a 4 cu ft cabinet for storing ice-cream and frozen foods at a temperature of -5 deg F, a cold plate for display purposes and a 5 cu ft domestic refrigerator.

An exceptionally fast farm freezer with a capacity of 11 cu ft was displayed by York Shipley, Ltd., on whose stand could also be seen the Kline-Nicholls portable beer and mineral water cooler which with the aid of a $\frac{1}{4}$ h.p. unit is claimed to reduce the temperature in 20 dozen bottles by 7 deg F in 15 minutes. A variety of other milk coolers, deep-freeze cabinets, cold rooms, service cabinets, storage cabinets, ice-cream freezers and conservators, bottle coolers, air coolers, condensing units, evaporators, etc., was shown by Frigidaire, Ltd., Nash-Kelvinator, Ltd., the Lightfoot Refrigeration Co., Ltd., J. & E. Hall, Ltd., L. D. Wood (Eldwood), Ltd., the General Utility Co., Ltd., and Frigicold, Ltd. In addition to refrigeration plant for low temperature work, such as ice-cream and other hardening tunnels, quick freezing plants, etc., G. & J. Weir, Ltd., exhibited homogenizers.

Apart from the E.D.A. display, the General Electric Co., Ltd., also paid special attention to dairy sterilizing equipment, with particular reference to appliances with a low electrical loading. The exhibit included a 27 cu ft self-contained chest and hotblock units to provide steam and hot water. A water heater designed to provide an inexpensive means of supplying hot water in the dairy was among others displayed. A block type sterilizing chest was also shown by Barford (Agricultural), Ltd., while, apart from "Electrobloc" sterilizers and dairy steam raisers, J. W. Woolley & Co., Ltd., introduced a new 1 cwt square type potato steamer with thermostatically controlled 3 kW immersion elements, and an electrically heated poultry trough.

A new cream separator was shown by the Alfa Laval Co., Ltd., and examples of electrically operated butter churns were seen on the stands of the Churn Co., Ltd., and J. J. Blow, Ltd. High-speed butter and

(1) "Prestcold" chilled water cooler; (2) Sterne hermetically sealed system applied to a cold room; (3) Woolley potato steamer



margarine moulding and wrapping machines, as well as egg grading, stamping and candling machines were demonstrated by Brecknell, Munro & Rogers, Ltd.

Bottle washing machines for the smaller dairy are a speciality of Nathan's Sales, Ltd. Various types of bottle washers and fillers were shown by Perkins Clean Milk Equipment, Ltd., while Cockx & Sons drew special attention to their type " R " automatic bottling machine. The " Monarch " aluminium cap making machine was shown by David Evans (Dairy Engineers), Ltd., for the first time fitted with a conveyor and fully automatic sealing unit, the complete assembly being capable of dealing with up to 10,000 bottles an hour. With a complete range of ice-cream cutting, dipping, wrapping and parcelling machines, carton forming and closing machines, Rose Bros. (Gainsborough), Ltd., exhibited a new pleat wrap machine for pork pies, cakes, etc. Other types of ice-cream cutting and wrapping machines and wafer biscuit wrapping machines were demonstrated by Auto Wrappers (Norwich), Ltd.

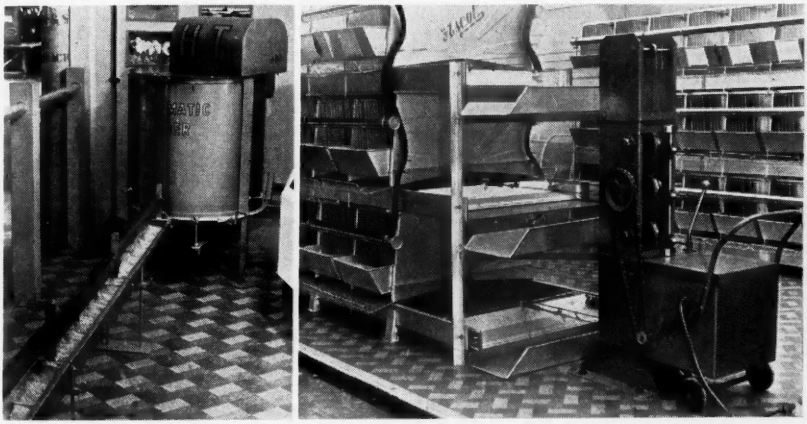
Both pig and poultry farmers will have found the various displays of food preparation equipment and infra-red apparatus of particular interest. Whitlock Bros., Ltd., had on view a 10 cwt mash mixer, while J. J. Blow, Ltd., included examples from its range of mincers and shredders capable of dealing with up to 1,700 lb of roots an hour. E. H. Bentall & Co., Ltd., showed one of their " Wizard " automatic hammer mills.

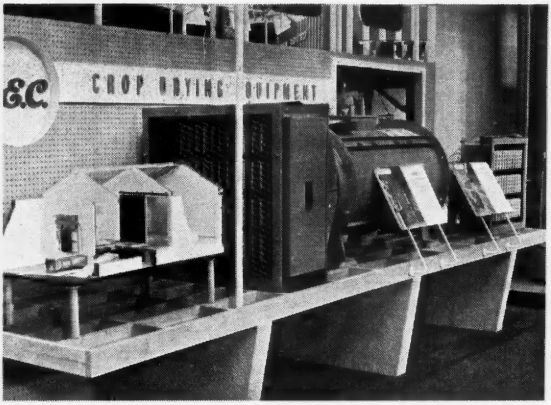
Mortality after farrowing is largely eliminated and the fattening of pigs is greatly accelerated by the use of infra-red heating. A unit has been specially developed for this purpose by the General Electric Co., Ltd. George H. Elt, Ltd., and Clarbat, Ltd., supply apparatus for both pig and poultry rearing. Some of the brooders supplied by the Visi-Chick Brooder Co., Ltd., are also equipped for infra-red heating. There were also numerous examples of electric warm-floor brooders, including some neat units by Millers Appliance Works, Ltd. Besides brooders, Cope & Cope, Ltd., showed plucking machines, as did also Comb Pluckers, Ltd.

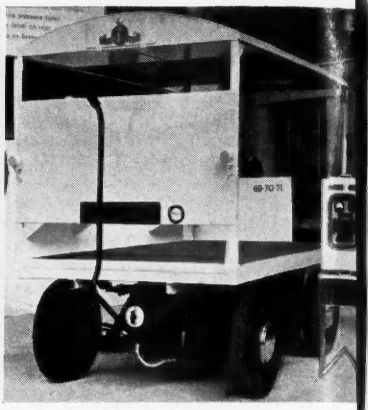
A very high proportion of the incubators, shown among others by Papworth Industries, Stephens' Cabinet Incubator Co., Ltd., Western Incubators, Ltd., Curfew Appliances, Ltd., and George Mixer & Co., Ltd. (" Primula "), were electrically operated throughout. Special units for hatching turkey eggs were shown by Mayfair Incubators, while Hordern Thirkell demonstrated their automatic flow feeder which by means of a conveyor system enables one man to feed up to 20,000 birds in a few minutes.

" Cafeteria " model cages with automatic electrically-operated self-feeding, watering and cleaning facilities were to

Hordern Thirkell automatic flow feeder for turkeys and *(right)* **A. F. Barker " Ascot " dropping tray cleaner**







G.E.C. crop drying equipment with cut-away model of a typical installation and *(right)* **" Morrison Electricars " P.90 pedestrian controlled battery vehicle with charger**

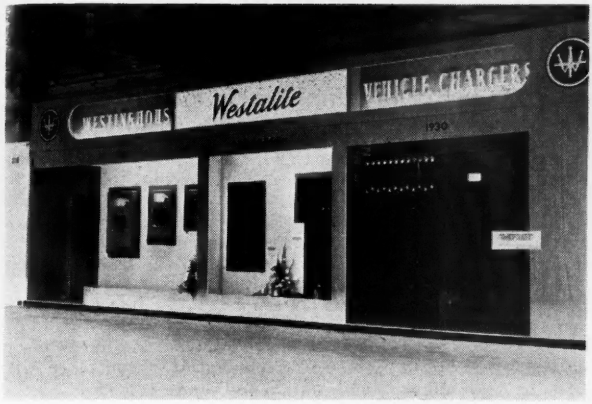
be seen on John Shepherd & Sons' stand. For the poultry farmer who does not wish to adopt a completely automatic installation A. F. Barker, Ltd., have developed the " Ascot " laying cages with an electrically-operated mobile dropping tray cleaner which can be used to deal with several rows of cages. Newman Hender & Co.'s " Ben Nevis " egg grading machine incorporates a " Perspex " dust-proof dome, a non-crack delivery conveyor, stationary weighing and cushioned stamping.

Chick sexing can now be carried out with 100 per cent accuracy by electrical methods, it is now claimed. Two makes, both available for use on mains or batteries, were shown by Sexascope (London), Ltd., and Expert Chick Sexers, Ltd. (" Chixexer").

Crop drying plant is being adopted increasingly all over the country. A cut-away model of an in-sack installation appeared on the G.E.C. stand with actual " Aerofoil " and propeller fans manufactured by Woods of Colchester, Ltd., and combined with G.E.C. duct air heaters for in-bin and platform grain dryers. For use in grain silos, cold stores and glasshouses the British Rototherm Co., Ltd., showed a mercury-in-steel portable temperature recorder.

The industry's appreciation of the eminent suitability of the battery electric vehicle for dairy delivery work was evidenced by the large number of makes and types on view. Two new " Morrison Electricars " were shown by Austin Crompton Parkinson Electric Vehicles, Ltd. The first " M.E." pedestrian controlled unit, the P.90, which has a load capacity of 20 cwt or 90 gall of crated milk, costs under £300 complete with charger. A four-wheel wide track vehicle of exceptional stability and easy manœuvrability, it incorporates a trigger switch in the tiller control, hydraulic brakes being automatically applied when the tiller arm is raised. The body is arranged to hinge on the rear of the frame to expose the chassis for maintenance purposes. The standard body has a sheet steel canopy roof but variations, including a completely enclosed body, are available to meet individual requirements. The other new model is the S.D.30 30 cwt medium deck vehicle, supplied with fully-open or semi-open body.

Two versions of the Brush " Pony " vehicles with open dairy bodies were shown, two models also being displayed by Smith's Electric Vehicles, Ltd., a 2 ton N.C.B. Electric dairy truck and a 3 wheel 25 cwt " Percheron." The new " Endeavour " 30 cwt general purpose vehicle and the " Tough Ten " 10/15 cwt unit built to withstand really rough usage formed the contribution of Helecs Vehicles, Ltd. The " Vandot " 10 cwt dairy vehicle was shown by Midland Vehicles, Ltd. Further pedestrian controlled models were to be seen on the stands of Diamond Motors (Wolverhampton), Ltd. (" Graiseley "), T. H. Lewis, Ltd. (" Elektruk ") as



A comparison of old and new type Westinghouse vehicle battery chargers

insulating rods to fill the spaces between the separators at the edges of each negative plate and so obviate the formation of the spongy growth liable to cause interior short circuits. Tudor vehicle batteries embody shock-proof triple separation and many other interesting constructional features.

To demonstrate the progress made in the manufacture and performance of their vehicle battery charging equipment the Westinghouse Brake & Signal Co., Ltd., exhibited two copper-oxide chargers over twenty years old alongside new streamlined models shown in three sizes to give maximum performance for minimum space and weight.

well as of Sidney Hole's Electric Vehicles.

Among traction batteries used for electric vehicles the new "Kathanode" cells manufactured by the D.P. Battery Co., Ltd., have been provided with special

Reheating at Dunston

A PAPER on the design and operation of Dunston "B" generating station with particular reference to the 50 MW turbo-alternators served by re-heater boilers was presented for discussion at a joint meeting of the Institution of Mechanical Engineers (Steam Group) with the Institution of Electrical Engineers in London on 24th October. The authors were Mr. A. Howell (head of the Mechanical Engineering Department of Messrs. Merz and McLellan) and Mr. J. B. Jackson (chief generating engineer (operation) of the North Eastern Division of the British Electricity Authority). The two machines with which the paper dealt were commissioned towards the end of 1950 and they ranked as the most efficient generating plant owned by the B.E.A. during 1951.

Part I of the paper indicated how their design had changed by comparison with the original plant installed 19 years previously. Part II of the paper discussed plant staffing and staff training. It gave details of operating experience, including methods of overcoming initial plant troubles and the procedure eventually evolved for starting up and shutting down, together with the methods adopted to permit full load to be carried within 90 min from starting. Performance and "outage" figures (1951) were analysed and test results tabulated, including those of throw-off tests and monthly performance tests.

It was concluded that "unitised" plant could be controlled so closely as to achieve test conditions and test performance in commercial operation, but that attention needed to be drawn to detailed improvements in design and workmanship. The need was stressed for more care in making joints and tightening bolts in high pressure parts of the plant.

The authors concluded by indicating economies and improvements that might result from the experience already gained.

Milk Coolers

The National Institute for Research in Dairying, Shinfield, near Reading, has prepared test reports (price 1s each, post-free) on the Cowley chilled water milk cooler (No. 51C/1) and the Nash and Thompson 60 gal milk cooler (No. 51C/7).

RESEARCH REPORTS

New Publications Describing the Work of the E.R.A.

A NUMBER of reports relating to various aspects of the research work which is being conducted by the British Electrical and Allied Industries Research Association have just been made available for the information of interested engineers and physicists. They can be obtained at the prices indicated in parentheses on application to the Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Polar derivatives of long-chain paraffins frequently exhibit dipolar rotation in the solid state. This is of interest in the behaviour of such dielectrics as, for instance, polyvinyl derivatives. In Report Ref. L/T251 by V. Daniel, Ph.D., F.Inst.P. and K. H. Stark, B.Sc., A.Inst.P. (9s), dipolar rotation is investigated in mixtures of a ketone and a paraffin which exhibit order-disorder transitions. It is found that quite small changes of crystal structure greatly change the extent of dipolar rotation, while dipolar interaction has no noticeable effect. This result is interpreted in terms of the energy conditions in solid paraffins.

Wind Turbine Theory

In Report Ref. C/T105 by H. H. Rosenbrock (6s) it is explained that the momentum theory of the wind turbine, as usually stated, leads to the result that the axial wind speed through the turbine disc is the mean of the undisturbed wind speed in the slip-stream far behind the turbine. The least possible velocity of the slip-stream is zero, so the speed through the turbine disc cannot be less than half the undisturbed wind speed. In other words the interference factor a, according to the theory, cannot be greater than 0·5.

In practice, however, a can approach 1·0, and no critical change appears to take place when $a = 0{\cdot}5$. Both the thrust coefficient and the power coefficient change gradually and smoothly as a increases from zero to nearly one. This discrepancy between theory and practice has been resolved by a slight extension of the momentum theory to cover interference factors from 0·5 to 1·0.

Report Ref. L/T278, "The Electrochemistry of Non-Aqueous Solutions," by I. G. Roe, Ph.D. (15s) is an abridged version of a thesis for a Ph.D. degree. It discusses the anomalous behaviour of certain weakly conducting organic solutions when subjected to an ionizing potential over a period of time. Various systems of picric acid in nitriles and ketones were used in the investigation and observations made of the variation of equivalent conductance with concentration and time.

Transmission Tower Foundations

In the design of footings for steel-lattice transmission line towers, information is required on the bond strength of angle-section galvanized steel reinforcing in concrete. Report Ref. O/T7 by G. Mole, Ph.D., F.Inst.P. (12s) describes tests which have been made to determine the relative influence of: (1) round or angle section, (2) smooth or rough surface, (3) plain or galvanized steel.

The results are sufficiently consistent to allow significant conclusions to be deduced. These show that there are no large differences between the bond strengths of round and angle reinforcing, and the bond strength of galvanized reinforcing is nowhere less than two-thirds that of plain steel.

Recent experimental work by J. J. Lander with an ultra-high-speed oscillograph showed the existence of a transient arc of duration less than 0·1 μsec between contacts breaking a circuit which was supposedly non-arcing. These results gave support to the suggestion that inductive energy stored in a circuit at break might account for fine transfer which had previously been considered independent of arcing. Report Ref. U/T125 by J. Warham, B.A. (12s) describes the effect on fine transfer of the circuit self-inductance in the range 0·05 to 10 μH. The results show that for platinum contacts at 6 V and 1·75 and 0·95 A there is a residual transfer independent of inductance, but transfer is dependent on inductance when the latter is greater than about 0·3 μH.

Cost of Plant and Cost of Supply

By D. J. BOLTON*
M.Sc., M.I.E.E.

Should Capital Charges Reflect Historic or Replacement Cost?

TWO recent publications lend a new interest to a very old controversy. The Iron and Steel Corporation, whose first report has now appeared, has allocated a further £5 million for additional depreciation which "is essential in the opinion of the Corporation to build up the funds necessary to make good at current replacement costs the depletion of fixed assets during the 7½ months period." A second document, the Ridley Committee Report, discusses at length whether coal prices should be based on mean or marginal costs, though in this case the difference is not, as with electricity supply, due chiefly to the increase in plant prices. The fourth report of the British Electricity Authority also devotes considerable space to restating the attitude of the Electricity Boards to this problem.

The question whether depreciation provision should be based on the initial cost or the replacement cost of the plant arises whenever there is a rapid increase in prices, particularly in industries like electricity supply employing expensive and long-lived plant. In such a case the industry is likely, for a number of years after the price increase, to be running largely on cheaply-bought plant which cannot be replaced at anything like the old figure.

In fact, if a technical programme were being arranged for the wireless, a nice little argument could be got up on this very subject. Two teams, each containing, say, an engineer, an economist and an accountant, could be lined up on the two sides, with a chairman to keep the peace and represent the consumer. If one were to summarize the arguments likely to be brought to bear by the two sides in such a discussion they would probably run something like this:—

I.—*In favour of providing on the replacement-cost basis*

(*a*) It is the economically "correct" thing to do.
(*b*) Failure to do so is "inflationary" in tendency, and likely to dissipate national resources or to divert them into wrong channels. (This is really a consequence of (*a*).)
(*c*) It is financially convenient since the extra capital which will be required when present plant has to be retired is accumulated gradually, and does not require additional borrowings, possibly at a rising rate of interest.

II.—*In favour of providing on the initial-cost basis*

(*a*) It is the accountancy "correct" thing to do (though this decision has been questioned in some recent discussions by accountants).
(*b*) Unless carried out equally and simultaneously by all competing industries replacement cost provision is likely to distort natural economic processes far more than the alternative procedure.
(*c*) Replacement cost provision is politically inconvenient, not to say impracticable.

These arguments are in several respects nicely balanced; the two (*a*)s can be set against each other, likewise the two (*b*)s and the two (*c*)s. In fact, provided our Brains Trust can keep its temper a very illuminating discussion should ensue. Without pretending to anticipate the brilliant repartee and lively ripostes of such an exercise one might perhaps jot down notes on each of the above points.

I (*a*). The position of electricity supply, using largely pre-war plant to supply a post-war load, is rather like that of a shopkeeper having an enormous stock of some

* The views expressed in this article are purely personal ones.

article whose cost has suddenly gone up. Suppose that the articles originally cost him 4d apiece, and he has been selling at 6d; furthermore that the cost has now increased three-fold, so that he can only replace the articles for 1s apiece. The ultimate future sales price will probably be 1s 6d. What price shall he put on his remaining stock?

The correct answer on strict economic tenets would appear to be 1s 6d. It is true that he will then be open to the charge of "profiteering" but this will soon right itself as new stocks come to be bought, and anyhow, it is a normal long-run commercial hazard which can be set against losses incurred when prices drop. That an immediate price increase to 1s 6d is "correct" can be seen by examining the results of not making such an increase. The results will be that the public will be encouraged to squander the article, i.e., they will tend to buy somewhat more than they really need, because they are getting it considerably below its real cost, and more than they should as compared with a competing article using less resources in its manufacture but costing more in the shops. Some time and money will also be wasted because normal shopping practice will be distorted; the public will swarm round that particular counter and the shopkeeper will soon be cleared out.

This argument makes unduly heavy weather of what in practice would be no problem at all. In fact, the shopkeeper would probably steer some intermediate course and secure both a wider margin of profit than usual and the publicity value of a bargain sale. Matters would, in any case, adjust themselves in a few months with no great harm done either way. What makes the problem serious in electricity supply is that matters take, not just a few months, but many years to right themselves, and they concern a very large element in the total expenses, viz., capital charges on some £1,000 million worth of plant.

Interest Charges Also Involved

Unfortunately the economist's "true cost" argument does not stop at depreciation provision. Strictly applied, it should extend to interest charges as well. Since it cannot apply to the *actual* interest charges, which are factual and arise from specific loans and other capital commitments, this means that the true cost calculation is something divorced altogether from the actual operations and accounting of the undertaking. It therefore becomes a highly artificial concept.

The fact that interest as well as depreciation is involved in the argument can be seen from a very simple hypothetical example. Let us suppose that the power stations are not owned by the B.E.A. but are rented from a commercial body in the way that much shoe-making machinery is rented by the shoe manufacturers from the British United Shoe Machinery Company. The rate charged would have to cover interest, depreciation based on the average life estimate, rates, insurance and profit margin, in total amounting to, say, 8 per cent of the purchase price, the rate being variable at three months' notice.

Let it further be supposed that the cost of building new stations went up overnight from £20 to £50/kW. The firm would immediately give notice to the B.E.A. that in three months' time the hire charge would be at the rate of 8 per cent per annum on £50/kW for all the plant employed. The B.E.A. would doubtless protest that the plant in question only cost £20, and that it would be thirty years before it would be entirely replaced by £50 plant. But the firm would probably make the commercial rejoinder that if the Authority knew of a better plan it could follow it, i.e., the alternative would be for the Authority to build its own stations, and since they would all cost £50/kW the expense would be just as great.

Consider now the reverse process. Suppose that after a long high-price period the price of new plant suddenly dropped again and new stations could be built for £20/kW. The Authority would immediately claim a corresponding hire reduction on the whole of the plant employed. It would now be the turn of the firm to complain that these stations cost far more, and the rent on them should remain high until they were replaced. The Authority, however, would now have the whip hand since it can itself build new stations at £20/kW and will certainly do so unless the firm drops its charge on the old ones.

The above picture has, of course, been simplified out of all recognition because it assumes a sudden substantial change in costs, and ignores the inflexibility of the supply situation. Electricity supply is not an over-the-counter cash transaction but involves long-term commitments on both

sides. On the one hand there is the country's continuing load which *has* to be met, and on the other hand the station equipment which has little value to anyone except the supply undertaking. However, the example, even in these crude terms, shows (perhaps all the better for its crudity) that immediately the cost of building new stations goes up, the marginal standing cost on *all* the electricity generated (whether by old or new plant) goes up proportionately, because this marginal standing cost is defined as the increase in expenses through having to supply one additional kW of demand.

Argument I (*b*) follows from (*a*). If it is true that electricity or anything else is being sold for less than the cost of its replacement the public are to that extent being encouraged to consume unduly. Argument I (*c*) is not a strong one unless interest rates are rising as well as plant prices. A high depreciation provision is in the nature of an enforced saving which to that extent reduces the need for future loans; but whether it is economically worth doing depends on the view one takes as to the trend of future interest rates.

Purpose of Depreciation Provision

Coming now to arguments on the other side, there is a certain confusion between the origin and purpose of making the depreciation provision, and the actual use to be made of the depreciation fund when it matures. The purpose of making the provision is to conform to accounting rectitude, viz., to see that, each year, sums are set aside corresponding to the life expiry of the plant employed. If no such provision is made the undertaking is living on its capital; sooner or later the plant will have to be retired, and the undertaking will then be faced with a debt on account of its initial purchase and with no asset to correspond.

If on the other hand the sum set aside each year is such as to accumulate to the amount of the loan by the end of the life, then this matured sum can be used to amortize the loan and the undertaking is financially sound, having no asset but no corresponding debt. Assuming, however, that the business is to be carried on and not wound up completely, what is needed is not to pay off the initial loan but to purchase replacement plant. The matured depreciation fund will therefore be used not for loan amortization but for replacement purchases, for which purpose it is inadequate if plant prices have risen.

The position, therefore, is that, from the standpoint of conventional accounting, depreciation provision is related only to historic cost. All strict requirements have been met if the undertaking is as solvent at the end of the plant life as it was at the beginning. Depreciation is then defined as "expired capital outlay" and the only provision necessary is to replace this outlay year by year so as to finish all square. If at this time new plant costs twice as much per kW as before, then the new loan will have to be twice as great as before for the same output, and the new interest charges and depreciation provision will be twice as great. Then (but not till then) the price of the product must be raised in order to cover the extra capital charges.

The strict letter of the law, according to accounting, is, however, subject to modification and there have been various suggestions that if, during the life of the initial plant, prices rise in all directions and the undertaking's output is correspondingly more valuable, it might be prudent to raise interim prices sufficiently to provide a supplementary "price-increase" reserve which would cushion the shock when expensive new replacements became necessary.

Effect on National Resources

Argument II (*b*) can be used to counter I (*b*) by pointing out that no industry works in a vacuum but forms part of an elaborate complex of interrelated activities. Action by a single industry would distort the natural competitive position and probably waste national resources to a far greater extent than any failure to observe strict marginal-cost principles. The annual reports of the nationalized electricity, gas and coal industries make it clear that all three follow the same policy in the matter, basing depreciation provision on historic cost, and uniformity of policy is here more important than academic correctness.

Probably the purely practical argument under II (*c*) is, however, the strongest of all. Taking first the interest charges: these are not within the industry's competence to alter, and if some scheme of artificial interest "costs," unrelated to actual occurrences, were to be made for the sake of economic rectitude, and if prices were

raised to correspond with such " costs," the result over a period of years would be to accumulate reserves having relevance only to long-term changes in prices. Over the short term this would therefore conflict with the " break-even " principle embodied in the nationalization Acts whereby revenues must cover costs taking one year with another.

As regards depreciation, there appears to be nothing in the Acts to prevent the industries from making provision on a replacement-cost basis, but there would be strong public opposition to any increase in price being made before it became absolutely necessary. The accumulation of reserves, not easily shown to be essential, would be a constant invitation to their being raided in the interests either of the consumers or the employees.

Straight-line System

In the matter of depreciation provision there is another factor besides plant prices which must be brought into consideration, that is the basis or formula on which the provision is calculated. In the case of electricity supply, as with the other nationalized fuel industries, the basis chosen for post-vesting assets is that known as straight-line: i.e., if an asset has a first cost C and an estimated life L an equal amount is written off each year, and the annual depreciation provision is C/L. Since a separate " fund " is not set up, and no credit is taken by the depreciation allocations for the savings they effect in the burden of interest falling on the undertaking, it follows that such a provision is (*a*) excessive in magnitude and (*b*) uneven in its incidence, imposing a net burden which is higher in the early years of the asset's life.

The second objection turns out to be illusory. It is valid when there is a single large asset with one specific date of installation and of retirement, but not otherwise. When, as in electricity supply, there are very many and diverse assets having varied lives and dates of installation and retirement, coupled with a steady increase in the total volume, the earlier years of one asset will coincide with the later years of another, and the whole process may average out very well as between the years. In fact it has been shown* that with the sort of spread and growth of capital equipment characteristic of electricity supply, the distribution of the burden of depreciation provision between the several years may be almost the same under the straight-line formula as under the sinking-fund method.

The other objection to the straight-line system, that it gives too high a provision, is conveniently nullified by the factor discussed previously, namely, the failure to provide for high replacement costs. The two departures from economic rectitude are in opposite directions and tend to cancel out. Taking 30 years as an equated life for the whole of the supply assets the provision on a straight line basis would be 1/30 or 3·33 per cent whereas the actuarially correct provision with interest at 4 per cent would be only 1·8 per cent.

The position is not quite so clear in respect of pre-vesting assets owing to variations in accounting practice and to the different types of responsibility taken over. Broadly, however, the total depreciation provision is 3 per cent of the book value of the fixed assets, which compares very favourably with the figures just quoted.

Extent of Difference

It is important to have some idea of the size of the problem and the extent to which the mean price of all the plant employed now lags behind the new prices. Ideally one should consider the whole field of capital expenditure, more than half of which is on transmission and distribution equipment whose unit prices have gone up in parallel with those of generating plant. The difficulty, however, is in finding a suitable denominator. It is easy to express the cost of generating stations in £ per kW installed, but as regards transmission and distribution expenditure the corresponding unit should perhaps be £ per kVA of capacity to meet consumers' demand, which is less easily defined and certainly does not appear in any published statistics. Regretfully, therefore, the distribution expenditure has been left out of the picture and only the generation expenditure included, but it is probable that this partial view is fairly representative of the whole.

The figures used in the following estimate are those published by the Electricity Commissioners and continued by the B.E.A., namely, expenditure charged to capital account for generation, and installed capacity of generating stations. The

* " Electrical Engineering Economics," Vol. I, Appendix II. Chapman & Hall, Ltd.

"mean cost" is the simple quotient of these two figures while the "incremental* cost" is the rate-of-change of the two figures, i.e., the amount by which the capital expenditure has increased in a given period (e.g., one year) divided by the increase in capacity in the same period.

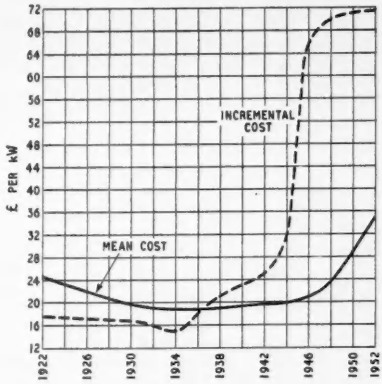
There are several difficulties in using the latter calculation as a measure of the cost of the new plant, although alternative methods such as a direct cost estimate are also open to objection. In the first place the increase shown in capital expenditure is a net figure, having been reduced by writing out the first cost of assets retired, while the installed capacity is similarly reduced to the extent of the capacity of the retired assets. These two minus items will not completely cancel out but will have the effect of increasing the apparent cost of the new plant.

Thus if 1,000 MW of plant at £65/kW were installed and 100 MW of plant at £20 were written out, the net increase of 900 MW would have a calculated cost of £70/kW. This effect should not be large in recent years owing to the relatively small proportion of assets being written off.

Another difficulty concerns the phasing of the capital expenditure relative to the commissioning dates. The commissioning of a generating unit is a specific event whereas the expenditure may be spread over half-a-dozen years. Thus, while most of the bills have been paid by the time the plant is commissioned, only about 20 per cent of the cost will have been incurred in the actual year of commissioning. The results will therefore be erratic unless the growth in capacity is fairly steady. This difficulty may be overcome either by drawing a smooth curve through a number of irregular points or (as here) by using a moving average.

Application of Method

The following illustrates the application of the above method in estimating the present-day cost of new stations. Taking the five-year period 1946–47 to 1951–52 and omitting the change in the nationalization year (in which there was a change in the included undertakings) there were four annual increments. Dividing each annual increment of capital expenditure by the corresponding increment of generating capacity gives a figure varying from £64 to £87/kW and having an average of £70/kW. Allowing for some exaggeration due to the reason stated above it would appear that the new price is approximately £65/kW installed.



Capital cost of generating stations in £ per kW (N.B. Under rising prices the new-plant cost is somewhat below the incremental-cost curve and vice versa)

The accompanying figure shows the curves of mean cost and incremental cost of generating plant from 1920, the first year of the Electricity Commissioners' returns, until the present day. The mean cost fell slowly to a minimum of about £19/kW in 1936 and rose even more slowly during the next eight years to £20. It then started to shoot up, and now stands at about £35/kW. Since the mean cost represents average generation expenditure per kW and the incremental cost represents rate-of-change of expenditure with kW, it follows that when the mean curve is falling the incremental curve lies below it, and vice versa. The two curves, therefore, cross in 1936 at a height of £19/kW. At the present time the incremental price is just about twice the mean price.

There are signs that the divergence between incremental and mean prices has already passed its peak, and unless plant prices increase still further (and to a substantial extent) the divergence should lessen considerably in the next few years owing to the high rate of plant purchase in relation to total plant. Naturally, if plant prices were to come down the divergence would lessen even faster.

* The word "incremental" is used in preference to "marginal" as being more familiar to engineers.

A final point is that electrical plant is very rarely replaced by identical equipment. When plant is retired for reasons of obsolescence this does not mean necessarily that its own efficiency and performance has gone down but rather that the standard has gone up. In fact all new generating plant (though not all distribution equipment) has a much higher efficiency than the average of all the plant installed, and some of the extra cost, as compared with historic costs, can be discounted because of technical superiority.

Summing up the arguments on the two sides, the main point on the one side is that the average book values of the plant on which interest and depreciation charges are reckoned is about half the price of new plant. Some increases in these charges therefore seem to be called for. Against this the following points may be put:—

(*a*) The position is in process of righting itself, probably with considerable speed.

(*b*) Although the value on which depreciation allocations are calculated is too low, the rate itself is too high and these two discrepancies go far to neutralize one another.

(*c*) Proportionately the provision for depreciation would appear to be at least as generous in the case of electricity supply as in the competing fuel and power industries, and any unilateral change would distort the natural competitive position and cause a waste of resources.

(*d*) The above calculations have been based on the assumption that new kilowatts are technically identical with old ones, which is too conservative an assumption.

Broadly speaking, while higher depreciation allocations may be academically correct they are for the most part impracticable if not dangerous. Any cushioning that may be necessary in the nationalized industries can probably be done within the existing framework by slightly increasing the allocations made to general reserve over the next few years so as to lessen the necessity for abrupt price increases as new plant comes into commission. The B.E.A. Report shows that this is in fact the policy of the electricity industry and that future surpluses are to be used in this way.

Condensation of Steam

Results of Recent Investigations

EXPERIMENTS have been performed at Queen Mary College, University of London, for the mechanical engineering research organization of the Department of Scientific and Industrial Research for the critical examination of the mode of steam condensation, particularly when it occurs in the dropwise form. The results are summarized in a paper which Messrs. H. Hampson and N. Ozisik recently presented to the Institution of Mechanical Engineers in London.

The duration of life of a surface causing purely dropwise condensation was found to be appreciable. Quantitative measurement of the heat transfer rates were also made at high heat loads on flat surfaces. Analysis of the results and examination of the possible application in practice indicated that steam condenser surface areas with high heat loading could be reduced appreciably from the present value, provided that little non-condensable gas was present. The presence of a small quantity of promotor was considered tolerable, while suitable water side conditions could be maintained. The effects of departure from these conditions which occurred in practice were discussed.

It was not suggested by the authors that dropwise condensation could be attained in all apparatus using a vapour condensation, but it was anticipated that the development of synthetic resins which could be applied in very thin adhesive films, or other promotors, which were not objectionable in very small quantities in boiler feed water, might lead to the wider utilization of dropwise condensation. For example, a British patent (Philips Lamps, 1942) claimed that zirconium would produce dropwise condensation without a promotor, although, with the treatment described in the present paper, this metal was found to cause filmwise condensation for many hours. It did nevertheless very readily cause dropwise condensation without elaborate preparation when touched with oleic acid. Such developments as these might justify the anticipation that the employment of dropwise condensation might be realized in practice. This expectation justified continuance of research.

Arc-Furnace Control

Air-Blast Breakers at Steel Works

EARLY in the last war a number of arc furnaces were built for the production of special steels for armaments. At that time it was considered that the standard oil circuit breaker was unsuitable for the heavy duty of controlling the h.v. input to a furnace transformer, which normally involved about 500 operations a week, breaking currents ranging from the transformer magnetizing current up to fairly heavy fault currents. Very careful and assiduous maintenance was required every week, necessitating changing or filtering the oil and dressing the contacts; some equipments were even supplied with specially strengthened bearings and other moving parts and in some cases special oil filtering equipment was actually fitted to the breakers.

The air-blast circuit breaker, which was being developed, appeared to be superior to the oil breaker for this heavy duty due to the fact that the arc is drawn in air, a fresh supply of which is provided for each break operation, and to pneumatic control permitting flexibility and lightness of moving parts.

A number of air-blast breakers supplied during the war and in the following years have given consistent service on arduous duty at from 3·3 kV to 33 kV, maintenance being much reduced. An English Electric air-blast breaker equipment installed at the Brymbo Steel Works, near Wrexham, rated at 6·6 kV, 150 MVA, 800 A, was the first to be commercially installed for this service by a British manufacturer. It went into commission early in 1940 and, after the minor initial troubles, has given trouble-free service ever since, except for a period of about two years just after the war when the furnace was out of commission. After continuous operation for 13 months, involving about 26,000 operations, the breaker has recently been stripped down. Apart from the weekly external inspection and draining the water from the compressor receiver, no maintenance had been carried out.

The pneumatic equipment, including the control valves, blast valves and compressor equipment were found to be in perfect order, and the whole equipment is being returned for service without any replacement being necessary. The fact that the pneumatic equipment and the compressors require as little maintenance as the breakers themselves demonstrates the superiority of this type for arc-furnace control.

The only advantage which an oil breaker might appear to have is that its initial cost is generally less than that of an air-blast circuit breaker and its compressor equipment. In fact, however, this extra cost is small in proportion to the total cost of a furnace installation, and the extra expenditure on air-blast equipment is more than compensated for by the saving in maintenance and repair.

Photograph of the contacts (unretouched) of an air-blast circuit breaker after 26,000 operations in arc-furnace control in a steel works. The wear is so slight that they are being refitted for further use

Electrical Measurements and Chemistry

I.E.E. Section Chairman's Address

WHEN he delivered his inaugural address as chairman of the Measurements Section of the Institution of Electrical Engineers in London last week, Dr. L. Hartshorn (National Physical Laboratory) spoke about electrical measurements and chemistry. He said that the volt was the most widely used of all the electrical units and in every electrical laboratory in the country it was for all practical purposes defined by the standard cell. The standard cell was thus of great importance in electrical measurements and it was rooted in chemistry. Furthermore, electrical measurements generally were penetrating chemistry more and more every day.

Dr. Hartshorn then described in some detail the manufacture of standard cells making particular reference to the N.P.L. construction. He said that much of the work involved was of a chemical nature and required great accuracy to ensure constancy of output from cells during their working life. He showed how closely the ideal had been approached by referring to the performance over a period of nearly 20 years of a few representative cells at the N.P.L. The fluctuations in value of individual cells amounted to $\pm$ 2μV or 2 parts in a million, two of the cells having been used throughout the whole period.

A more direct check on the extent to which chemical factors were under control during construction was provided by the reproducibility of cells made by the N.P.L. procedure over the same period. The total spread for some 300–400 cells was only 40 μV and for any one batch the spread was only 10 μV or $\pm$ 5 parts in a million.

The chairman then turned to the technique of moisture measurement which exploited the fact that the dielectric constant of water was larger than that of most materials which absorbed it so that the overall dielectric constant of moist material increased rapidly with the proportion of water present. He made particular reference to an experiment in the techniques of frequency control which demonstrated that electrical moisture measurement was now practicable in the most unfavourable cases, that of gases and vapours.

Dr. Hartshorn said it was impossible to approach chemistry from the electrical side without stumbling across pH which indicated whether a solution was acid or alkaline. He therefore described the pH meter and explained that the difference between the cell determining pH and the standard cell was that the negative electrode which was immersed in the solution to be measured must be a hydrogen electrode instead of cadmium. This, however, was not used except by the N.P.L. and similar institutions, the glass electrode being used in industry. It might seem absurd that glass should be used as the material for an electrode, but a piece of research recently published by the American National Bureau of Standards provided the answer: water was absorbed by glass.

In conclusion, the chairman briefly referred to two other applications of electrical measuring techniques to the needs of chemists. The first was another form of primary cell which acted as an oxygen meter for gas mixtures, containing small amounts of oxygen—0·5 per cent and under. The second instrument was very similar to the oxygen meter but was more general in its scope since it enabled chemical analysis both quantitative and qualitative to be performed by electrical measurements alone.

Joint Meter Reading

MR. H. Evans, chairman, told the Merseyside and North Wales Electricity Consultative Council at Liverpool last week that the B.E.A. had agreed to experiments in joint reading of gas and electricity meters. The idea was not new, he said. The old Liverpool Gas Company had gone into the matter in great detail many years ago and had come to the conclusion that administrative difficulties would outweigh any advantages.

VIEWS on the NEWS

By REFLECTOR

STREET lamps operated by time switches are erratic in their behaviour from time to time so that one sometimes hears people complaining that some particular light may be on in the daytime and out at night. I have been assured that local authorities welcome information from residents when such troubles occur, to supplement the normal reports by the men who go out on evening scouting duty. In view of this it is the duty of electrical men to report failures rather than allow the impression to get around that electricity services are inefficient.

* * *

It is still true, in spite of the many statements made to the contrary, that the average price of electricity has not risen at the same rate as the cost of most commodities. Where tariffs have been examined and standardized some people who have hitherto obtained their electricity at rates which have favoured them at the expense of other consumers have been brought into line and their bills have been considerably increased. A baker in the North Western Area recently complained that his bill had risen by 110 per cent. His case was dealt with by the chairman (Sir Joseph Hallsworth) who, as reported by the *Manchester Guardian*, asked "Are not cakes more than double the price they were?" and said that the baker was getting his electricity at uneconomic pre-war rates. The old tariff was fixed when coal was 30s a ton; now it was more than 60s.

* * *

A combined electric and gas cooker is advocated by the *Liverpool Daily Post*. It says that "the housewife who wished to heat a kettle of water quickly would be able to light up the gas at one of the points on top of the cooker but if she preferred an electrical point for simmering she would also have one at her disposal." Nothing is said about the oven. The paper mentions that such combination cookers are seen on the Continent and, I may add, they are not unknown in the United States. My contention is that if the electric cooker is properly equipped any sort of quick-heating gas arrangement is unnecessary. Heavily loaded open-type boiling plates with adequate control should be considered essential and if they are employed the only substantial argument in favour of gas disappears.

* * *

Another paper, the *Bolton Evening News*, comments on the rivalry between gas and electricity. It compares the rapid advance of electricity consumption in north-west England with the "slow trudge forward" of gas. It hints at bigotry on the part of electrical enthusiasts and says that when the gas industry endeavours to prove its greater thermal efficiency its contention looks more convincing when its showrooms are electrically lit, electricity being admitted to be the best lighting medium. The Bolton paper goes on to say:—

> "This more mellow approach lends greater weight to the claim that for cooking, intermittent room heating, water heating and refrigeration, gas is to be preferred."

It is strange reasoning to suggest that because one position is made untenable others are thereby strengthened.

* * *

It has been suggested to me that my last week's note on the *Electrical Review's* offer to act as a "clearing house" for electrical functions may be misunderstood. I said that the offer was not being generally taken up but I am told that there has been an excellent response and already many clashes of dates have been prevented.

* * *

Once the lay Press gets hold of what it thinks is a good idea it never lets go. One of these ideas is that people's Sunday dinners are constantly in jeopardy from electricity stoppages. Reporting an improvement in the generating plant situation the *Daily Graphic* inevitably heads its note "Sunday Joint is Safer as Power Cuts end Sighted."

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT a recent meeting of the North Western Electricity Board, **Alderman Wright Robinson** was presented by the Board and chief officers with an electric fire, as a token of their regard upon his retirement from the position of chairman of the North Western Electricity Consultative Council. The presentation was made by Sir Joseph Hallsworth, chairman of the Board. Ald. Robinson's successor in the position of chairman of the Consultative Council, **Alderman F. Kenyon,** is deputy-mayor of Oldham and a member of the staff of the transformer testing and inspection department of Ferranti, Ltd.

Mr. A. M. F. Palmer, A.M.I.E.E., was elected Member of Parliament for the Cleveland Division of Yorkshire in the Labour and Co-operative interest last week. This marks the beginning of his second term in the House; he was member for Wimbledon from 1945 to 1950. Mr. Palmer was with the London Power Co. for about nine years and in 1945 became editor of the *Electrical Power Engineer*, the official journal of the Electrical Power Engineers' Association, and director of studies for the E.P.E.A.

Mr. A. M. F. Palmer

At the annual meeting of the National Union of Manufacturers on 16th October, **Mr. C. S. Garland,** A.R.C.S., B.Sc., F.R.I.C., M.I.Chem.E., chairman of Stream-Line Filters, Ltd., resigned the office of hon. treasurer after twenty-seven years' service. He was re-elected a vice-president.

Mr. B. W. A. Dickson, who recently relinquished his seat on the board of Vickers-Armstrongs, Ltd., has become a director of Oliver Pell Control, Ltd. (incorporating the Varley Magnet Company). Mr. Dickson was general manager of the Aircraft Section of Vickers-Armstrongs.

Mr. H. W. Garner has joined the sales staff of the Supra Electrical Co., Ltd., and is in charge of sales development in East London, and the County of Essex. During recent years Mr. Garner has been in charge of the Leyton branch of the Sloan Electrical Co., Ltd.

Mr. H. Hubbard has been appointed a director of Oakley Brothers, Ltd. This company, which is a subsidiary of W. T. Henley's Telegraph Works Co., Ltd., has a foundry at Cradley, Cradley Heath, Staffs, for the production of grey iron castings. Mr. Hubbard is manager of the Engineering Sales Department of the holding company.

Mr. H. Hubbard

Black & Decker, Ltd., have announced the appointment of **Mr. A. N. Greaves** as advertising manager. This position was previously held by **Mr. M. W. Boyce,** who was appointed sales manager in January, 1951. Mr. Greaves joined the company last year as assistant advertising manager.

Mr. J. P. Coleman, M.I.E.E., chairman and managing director of Gresham Transformers, Ltd., has been elected chairman of the London Region of the Engineering Industries Association. Mr. Coleman, who has been on the board of Gresham Transformers since 1939, is also a director of a number of other companies, including the Dancol Engineering Co., and Lion Switchgear, Ltd.

Mr. J. P. Coleman

Mr. L. J. Brown has been appointed managing director of Electric & Musical Industries, Ltd.

British Insulated Callender's Cables, Ltd., recently entertained approximately 350 members of the staff from sales and construction branch offices in Northern England and Scotland, to a dinner, dance and cabaret at the Casino, Blackpool. A vote of thanks to the

Company for their hospitality was proposed by Mr. J. Phillips, district engineer (overhead lines) Preston, and Mr. W. H. McFadzean, deputy chairman and chief executive, replied. After the dancing and cabaret the guests were taken by coach along the seafront to see the illuminations, the authorities allowing the lights to be kept on thirty minutes longer than usual for their benefit.

Mr. W. H. McFadzean speaking at the B.I.C.C. dinner held at Blackpool

The Gloucester Branch of the **Electrical Industries Benevolent Association** recently held a successful ball at the Bell Hotel, Gloucester. It was well attended and many well-known electrical men were present. During the evening a record number of prizes was distributed.

The Hants and Dorset Branch of the Association is holding its third annual ball on 6th February, 1953, at the South Parade Pier Pavilion, Southsea, Hants. Tickets (12s 6d each) which include running buffet and cabaret, can be obtained from Mr. A. Cadman, branch hon. secretary, British Electricity House, 111, High Street, Portsmouth.

We are informed from the Association headquarters that no more tickets are now available for the Electrical Industries Ball on 14th November.

Following the recent death of Mr. H. W. Cain, material controller of George Kent, Ltd., **Mr. J. F. Willsher,** formerly production controller, has been appointed production manager responsible for both material control and production control.

Mr. J. F. Willsher

Mr. E. H. Foster, A.M.I.E.E., has been appointed sales engineer in the Motor Control Gear Division of Arrow Electric Switches, Ltd. Mr. Foster, who served his engineering apprenticeship with A. Reyrolle & Co., Ltd., was previously with Powell Duffryn Carbon Products, Ltd., Hayes.

The annual dinner and smoking concert of the **Johnson & Phillips Foremen's Association** was held on 17th October at the McLeod Restaurant, Woolwich, and was attended by 145 persons. Among the guests were the chairman of J. & P., Mr. G. L. Wates, J.P., who presided, Mr. W. Glass (joint managing director), Mr. R. W. C. Reeves (director) and Mr. J. Innes (director, Telegraph Construction & Maintenance Co., Ltd.). Also present were senior members of the T.C. & M. staff, representatives from the T.C. & M. Foremen's Association and a number of the J. & P. management and staff. Following the speeches there was a cabaret.

The annual dinner of the North Midland Centre of the **Institution of Electrical Engineers** will be held on 14th November at the Queen's Hotel, Leeds. Col. B. H. Leeson, the president, will attend and the guest of honour will be Lord Milner. Applications for tickets (25s each for members, companions, associates and guests, and 15s each for students) should be made by 7th November to Mr. T. G. Bridgwood, Department of Electrical Engineering, The University, Leeds, 2.

The Mersey and North Wales Centre of the Institution is holding its annual dinner on 10th November at the Exchange Hotel, Tithebarn Street, Liverpool.

The Tees-Side Sub-Centre of the Institution will hold its annual dinner and reunion on 14th November at the Zetland Hotel, Saltburn-by-the-Sea.

OBITUARY

Mr. P. Croaker, manager of the Paper Cable Sales Department of Pirelli-General Cable Works, Ltd., died at Southampton on 6th October at the age of seventy-four. He joined the staff of W. T. Henley's Telegraph Works Co., Ltd., in 1902, transferring in 1910 to Marconi's Wireless Telegraph Co., Ltd., with whom he was responsible for the erection of masts and commissioning of stations both in this country and abroad. He was engaged for a number of years on this work in Spain, in

Ascension Island and in British Guiana. He joined Pirelli-General Cable Works, Ltd., in 1922 and had been manager of the Paper Cable Sales Department since 1928.

Col. J. S. A. Walker, J.P., T.D., a director of Walker Bros. (Wigan), Ltd., died on 17th October at the age of sixty-five. He was a part-time member of the North Western Electricity Board, and chairman of the governing body of the Wigan and District Mining and Technical College.

Mr. E. Fulford.—The death occurred on 21st October of Mr. Edwin Fulford, A.M.I.E.E., who retired from the position of district electrical engineer with the London and North Eastern Railway in 1937.

Mr. J. J. Honan.—The death occurred on 27th October at Limerick, Irish Republic, at the age of sixty-nine of Mr. John Joseph Honan, A.M.I.E.E., B.L., late assistant examiner, H.M. Patent Office.

Mr. Bertram Edward Stott, A.M.C.T., A.M.I.E.E., M.I.B.F., former managing director of Ferrous Castings, Ltd., died on 20th October at the age of sixty-six. Mr. Stott resigned from Ferrous Castings, Ltd., in November last owing to ill health.

WILLS

Mr. A. Ogilvie, late of the Sturtevant Engineering Co., Ltd., who died on 26th May, left £15,260 gross (£15,186 net).

Mr. A. Allan, electrical engineer and designer, and late managing director of C. H. Tate & Son, Ltd., Newcastle-upon-Tyne, who died on 4th June last, left £4,926 gross (£4,800 net).

Mr. P. H. Jackson, M.I.E.E., managing director of the Birmingham electrical engineering concern of the same name, who died on 8th June, left £11,567 gross (£11,419 net).

Mr. James A. Thomson, chairman and managing director of Brown Brothers, Ltd., who died on 20th June last, left £121,758 gross (£116,588 net).

Mr. F. W. Field, who was largely responsible for making Blackpool's illuminations nationally famous, died on 17th December last, leaving £679 gross (£608 net).

Mr. W. Dickinson, of the Bury District of the North Western Electricity Board, who died on 23rd April last, left £3,251 gross (£3,182 net).

Mr. F. Lonsdale, a director of the General Electric Co., Ltd., and late general manager of the company's Fraser & Chalmers Engineering Works, Erith, who died on 27th January last, left £2,907 gross (£2,211 net).

Mr. C. W. Bayliss, M.A., A.M.I.E.E., senior lecturer in the Department of Electrical Engineering at University College, London, who died on 15th June last, left £22,570 gross (£22,251 net).

STREET LIGHTING NOTES

BEESTON and STAPLEFORD U.D.C. decided some time ago to provide improved street lighting along the trunk roads in the district and the first section of the scheme was recently switched on. It comprises 154 140-W sodium type lamps erected along the A52 Nottingham–Derby road. The lamps are housed in the latest type of enclosed lantern manufactured by the G.E.C. which employ "Perspex" refractor plates for light control. These lanterns are attached to centrifugally spun concrete columns of the narrow base type made by the Stanton Ironworks Co., Ltd. The main contractors for the erection of the equipment were the General Electric Co., Ltd., and the North Midlands Engineering Co., Ltd. The installation, which stretches from boundary to boundary of the urban district, a distance of approximately 3¼ miles, was planned by the surveyor to the Council in collaboration with the technical staff of the East Midlands Electricity Board.

GILLINGHAM, Kent, Town Council has decided to increase the lighting in Dock Road (where a serious accident involving the death of a number of young naval cadets occurred a short time ago) as part of a scheme for the improvement of lighting generally in the borough. Existing lamps, mostly of 75 W, are to be replaced by two of 60 W. It is stated, however, that this will not bring the lighting up to modern standards, to do which would be a long and expensive job. Details have been received from the Commander-in-Chief, The Nore, of the improvements which the Admiralty proposes to make in the lighting of its part of Dock Road.

CARDIFF Corporation is recommended to approve a scheme for the provision of street lighting on both sides of Colchester Avenue by underground cables at an estimated cost of £3,225.

AMBLECOTE, Worcs., Council is asking the Ministry of Transport to approve the conversion of street lighting from gas to electricity. Figures submitted showed that the annual cost of lighting classified roads by electricity was £9 10s per lamp and by gas £13 13s.

NEWARK Town Council has been given permission to include in its general trunk road lighting scheme the conversion from gas to electricity of lighting in Farndon Road.

Gas lamps in Morrell Avenue, OXFORD, are to be replaced by electric lamps.

SCARBOROUGH Corporation is being recommended by the Water and Streets Committee to convert the remaining gas lighting in the town to electricity. There are 1,933 gas street lamps and the cost of conversion would be £80,000. The work, if approved, will be carried out over a period of 10 to 15 years. According to the borough engineer, the Corporation will save £3,500 per annum.

PARLIAMENTARY NEWS

From Our Special Reporter

MR. GAMMANS, the Assistant Postmaster-General, replying to a number of questions in the House of Commons last week, announced that the Government had decided to allow the B.B.C. to proceed with the setting up of television stations at Pontop Pike and Belfast in time for the Coronation. As a result of some considerable ingenuity on the part of the B.B.C. and Post Office engineers, temporary stations could be set up at these places at much lower cost than under the schemes originally planned. The B.B.C. hoped to be able to provide this interim service by using mobile transmitters and temporary aerials but these would naturally not give a service of the quality and coverage expected ultimately by the Corporation from its permanent stations. The Post Office, for its part, would do its utmost to ensure that, by the time the new stations were ready, the necessary links would be available to connect them with the existing television network. The service provided at these new stations would be continued until permanent installations could be brought into service.

The Government had carefully considered whether similar facilities could not be provided in the areas ultimately to be served by the three remaining planned stations, but found that the technical resources of both the B.B.C. and Post Office would be strained to the utmost in providing temporary service even at Pontop Pike and Belfast. However, the B.B.C. was also examining possible ways and means of improving service in fringe areas, even on a makeshift basis, but he was not very hopeful that it would be able to accomplish very much in that direction.

Replying to Lady Tweedsmuir, Mr. Gammans said that he could not promise to give the same service to Aberdeen as that which had now become possible in the case of Kirk o'Shotts and Belfast. He said that the low-power transmitter which was now at Kirk o'Shotts was to be used for the Northern Ireland transmitter but later corrected this statement, saying that the service was to be provided by one of the mobile transmitters which the B.B.C. owned and normally used for outside broadcasts. The low-powered transmitter at Kirk o'Shotts was a permanent part of the equipment of that station and was being retained as a stand-by in case of breakdown of the high-powered transmitter.

Mr. Ness Edwards asked what link was there to be between London and Northern Ireland—cable or radio? What was the capital cost of this and what would be the capital cost of any boosters which might be used in the fringe areas?

Mr. Gammans told Mr. Ness Edwards that so far as Northern Ireland was concerned there would be a radio link: for Pontop co-axial cable would be used. The estimated cost of these two stations and the temporary arrangement he had mentioned was of the order of £20,000 each.

Transmission to North America

Answering a question by Mr. Teeling, Mr. Gammans said it would be technically possible to relay television to North America, but the practical problems and the enormous cost of setting up any such system (probably £18 million) ruled the idea out for the present.

North Atlantic Cable

Mr. Hobson asked if the disused North Atlantic cable had now been repaired and brought into service.

Mr. Gammans said he understood from Cable and Wireless, Ltd., that the cable was brought into service again on 29th September.

Tax on Dry Batteries

Mr. Crouch asked the Chancellor of the Exchequer whether he would remove purchase tax from dry batteries used in radio sets.

Mr. Butler, who replied in the negative, said he could not make any statement on this subject.

Atomic Power

Mr. Geoffrey Lloyd informed Mr. Perkins that although the cost of electricity obtained from plants using nuclear energy could not yet be assessed, it seemed likely that such plants, when developed, would provide additional base load power stations. As hydro-electric schemes were complementary to base load stations, there were no reasons for restricting them on account of the potentialities of nuclear power.

Electricity Boards' Rates

Replying to Sir Harold Roper, Mr. Geoffrey Lloyd said that last year all the Area Electricity Boards agreed to the appointment by the British Electricity Authority of two independent advisers to make recommendations as to the apportionment of payments in lieu of rates. He saw no reason to dissent from the recommendations made by these advisers and he approved principles of apportionment accordingly for 1951–52 and the two ensuing years, after which

he understood the Authority would review the matter. He did not accept the suggestion that there must in consequence be a general addition to the cost of supply of electricity in rural areas.

Electricity Supply Expenditure

Mr. Geoffrey Lloyd told Sir Harold Roper that the Government did not allocate capital investment for electricity supply between new housing and rural development, but it would not wish new houses to which it was reasonably possible to bring electricity, to be built without a supply, involving the wasteful provision of temporary lighting arrangements. Each proposal whether for housing or for rural development had to be considered by the appropriate Electricity Board on its merits.

Rural Areas

Sir Harold Roper asked what consultations the Minister had had with the B.E.A. on the programme of capital expenditure on the supply of electricity to rural areas and with what results.

Mr. Geoffrey Lloyd said he was in constant consultation with the B.E.A. on the whole field of capital investment by the Authority and the Area Boards. The results of that consultation were embodied each year in the Government's decisions of investment.

Membership of Heavy Plant Council

Mr. Baker White asked the Minister of Supply, in the interests of security, why he had appointed a leading member of the Communist Party to the Heavy Electrical Plant Consultative Council, seeing that the members of the Council had access to confidential information regarding national defence and economic planning.

Mr. Sandys said he understood that the reference was to the appointment of Mr. Frank Foulkes to the Heavy Electrical Plant Consultative Council. The Council was composed of representatives of various organizations by whom they were nominated, and Mr. Foulkes was appointed on the nomination of the Confederation of Shipbuilding and Engineering Unions. It was not a new appointment since Mr. Foulkes had been a member of this body for a number of years. No information involving security risks was communicated to the Council.

Private Trading in Zinc

Lord Swinton announced in the House of Lords that the Government had decided that private trading in zinc could be restored as soon as the necessary arrangements could be made by the Ministry of Materials and the trade. Discussions with the trade and other interests concerned would take place at once and it was hoped that it would be possible to give effect to the decision on 1st January. A further announcement about the date would be made as soon as possible. From the date of reversion the private import and sale of virgin zinc would be permitted, and the London Metal Exchange would open for transactions in zinc. The Ministry of Materials would cease to trade in zinc except to the extent necessary to wind up its trading operations. He would like to take the occasion to pay a tribute to the great help they had had from their suppliers at home, in the Commonwealth and overseas in meeting the supply difficulties of past years.

Die-Casting Report

LAST week the Anglo-American Council on Productivity published the report of the Zinc and Aluminium Die-Casting Productivity Team which visited the United States last year (98 pp., price 4s, post free, from the Council at 21, Tothill Street, London, S.W.1). The team visited eighteen plants and had discussions with the staff of the leading American associations and trade union officials. While the team found that in pressure die casting the Americans were in advance of this country, in the case of gravity die casting British methods were considered to have reached a superior stage of development. There was closer co-operation in the United States between die casters and their customers, the latter being readier to adopt modifications of their designs to facilitate and cheapen production. There was a greater readiness on the part of managements and workers to try new methods and it was easier for American concerns to replace obsolete plant by new equipment.

Other points in favour of American producers were a wide use of incentive schemes, double day shift working, a greater supply of technically trained personnel, careful production planning and the fullest use of mechanical handling. The team makes a number of recommendations based on these observations.

Interpretations of the I.E.E. Rules

WITH the permission of the Institution of Electrical Engineers, the Electrical Contractors' Association has reproduced in convenient bound loose-leaf form the interpretations promulgated by the I.E.E. of its Regulations for the Electrical Equipment of Buildings. Copies are available at 1s 6d from the Association at 14, Bedford Row, London, W.C.1. Further interpretations will be made available for inclusion in the binder.

Switchgear Economy

System Planning, Choice of Equipment and Simplification

IN a lecture to the Electrical Power Engineers' Association (London Technical Group) last Monday, Mr. L. J. Bamber (Ferguson, Pailin, Ltd.) took as his subject economy in the choice of switchgear. A sound approach, he said, was by way of considering how much was really needed rather than how much could be cut out. Economies were dealt with under the three headings of system planning, selection of particular gear on a cost basis, and simplification. Regarding system planning, economy entailed acceptance of risks and some loss in operating facilities, and it should be recognized that less orthodox methods might impose more difficult conditions on operating staffs under abnormal conditions. Switchgear furnished testing points and economy must not introduce undue risks to the operator and must allow for human fallibility.

Importance of Protective Equipment

Protective apparatus should not be regarded as something added to switchgear but as an essential component of the whole scheme which governed the type and amount of switchgear required. It should be looked on primarily as a means of fault detection and its selection should be determined by minimum requirements to meet the character of the load supplied and the accepted risks with the fewest relays for tripping circuit breakers.

Faults per mile on 6·6 and 11 kV cables were statistically one in seventeen years and on overhead lines one in three to four years for short periods and one in twenty years for long breakdowns. Faults in transformers up to 1,000 kVA at the same voltages averaged one in 300 transformers per annum. With supervisory control, stand-by transformer capacity could be minimized. Its cost was but a fraction of that of the transformers eliminated and it provided rapid indication of faults and quick selection of an alternative source of supply. Instead of duplicating transformers, their peak overload capacity could be utilized.

The low fault risk for transformers would permit the protective zone of the associated cables to be extended to include them in a ring main scheme. In one arrangement which had been developed by the Merseyside and North Wales Electricity Board, only one breaker per substation was required, oil switches being employed for one cable end and the transformer. The protective current transformers were connected on the secondary side of the power transformer. An example was cited of a 33 kV reinforcement of a 6·6 kV urban network by a conventional ring main with 100 per cent duplication of transformer capacity for which the cost per kVA of firm capacity of 20 MVA (including land and buildings) would have been £8·4, whereas with ring main switchgear and 75 per cent transformer utilization the figure was £4·4.

In the event of a transformer or cable fault, one substation would be lost and the ring opened, which necessitated stand-by capacity equivalent to one transformer in the interconnected secondary cable network. Secondary fault level must be kept down to suit existing secondary switchgear. Reactive compounding might be necessary to avoid circulating currents in the secondary system when on-load tap-changing equipment was in use.

One-Switch Substations

The advent of fault-making load-breaking oil-immersed isolators had favoured the development of indoor one-switch substations, as previously applied to outdoor installations. This arrangement enabled five oil circuit breakers to be replaced by one metalclad circuit breaker and four isolators. A fault would trip the bus section switch and the breaker on the lower voltage side of the transformer in addition to breakers at the remote busbar substations. Only half the one-switch sub-

station would be put out of action by a fault on either transformer or incoming feeder.

Transformer feeders, in which the power transformer was in the same protective zone as its associated feeder, might meet immediate needs, but gave little flexibility to cope with development in nearby areas. Some economy could be effected by keeping the building space of small static substations within 2,000 cu ft, thus eliminating development charges.

For housing estates, at the present price of copper, the adoption of a distributed transformer system (rather than a low-voltage system) reduced the cost per house considerably, especially if oil switch-fuses could be employed.

For new systems a fault level of 250 MVA at 6·6 or 11 kV was suggested, compared with 150 MVA by network sectioning for existing systems with older types of circuit breakers. At 33 kV the usual maximum value was 750 MVA which might require reactive feed. In view of the heavy short-circuit currents at lower voltages, higher voltages more appropriate to the loading would be beneficial in many industrial establishments.

Oil switch-fuses might be suitable up to 50 A, but many engineers doubted their efficiency for fault interrupting. "Air-insulated" metalclad gear was being increasingly installed up to 250 MVA at 6·6 and 11 kV; it was reliable and less expensive than compound-filled gear. Where double busbars were required to afford greater flexibility in operation and reliability of supply, off-load selection by the transfer method was the least expensive. The cost of non-phase segregated metalclad switchgear per 750 MVA at 33 kV in examples quoted was about four-fifths of that of the segregated type. High building costs now generally favoured the choice of outdoor instead of indoor switching, but this reversal of previous practice made an undue demand on technical labour and lost important advantages found with indoor installations.

The lecturer emphasized the need for simplification. Oil switches, for instance, were often elaborated by additional features so that much of the advantage in cost over circuit breakers was lost. Only essential instruments should be installed. Metering current transformers could be designed with less special material if they corresponded more nearly with the burden of metering equipment. It was doubtful whether individual control panels could be justified in 6·6 or 11 kV distribution substations. Unnecessary back-up protection was often included. The fault risk on busbars was mainly due to the tappings; heating to avoid condensation on spout insulators reduced the risk and hence the need for busbar protection on secondary networks.

The lecturer concluded with a reasoned plea for the acceptance of manufacturers' standard designs with a view to lowering costs and avoiding delays.

Lighting in Dangerous Atmospheres

"SAFETY Electric Lighting in Industrial Hazardous Atmospheres" was the theme of the address by Mr. A. V. Milton, chairman of the Liverpool Centre of the Illuminating Engineering Society, at the meeting on 21st October. He said that a fundamental feature of flameproof lighting fitting design was that the temperature rise of any part of the external surface should not exceed 50 deg C with an ambient temperature between 15 deg C and 35 deg C, to give a maximum overall temperature of 85 deg C (185 deg F). On that account the wattage of lamps that were used must not exceed the wattage marked on those fittings. While this specified maximum temperature was considered reasonable in certain special conditions, such as cellulose spraying, it had been suggested in some quarters that it was unreasonably low for many hazardous situations. Some effort was being made to have this requirement reconsidered.

Although there were a number of portable handlamps for mains operation which had passed the tests of the testing authority, they should be used on a voltage of less than 30 V in order to reduce the risk of electrical breakdown and dangerous shock arising from mechanical damage. As painting of equipment might be necessary either during installation or maintenance as a precaution against corrosion, aluminium paint should not be used, for it had been established that under certain conditions sparks could result from this paint being struck by steel, copper, bronze or brass and the sparks might be sufficient to ignite inflammable vapours.

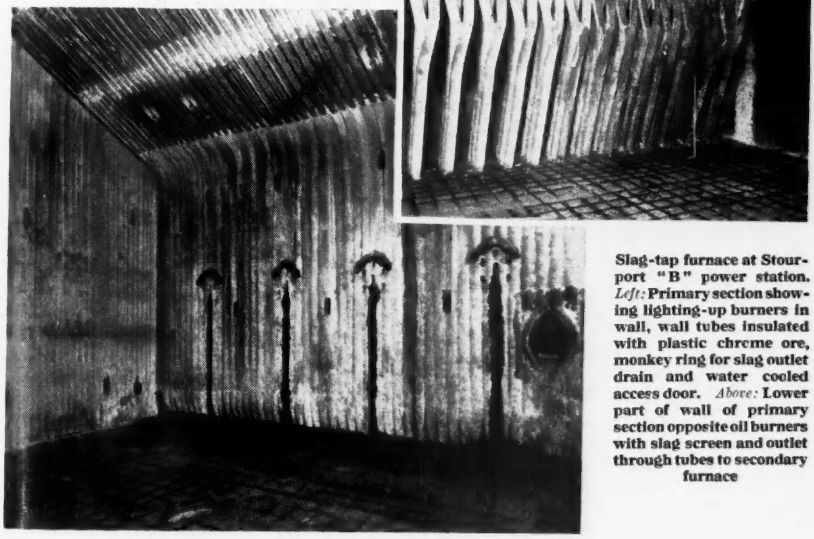
Ash and Clinker

Institute of Fuel Conference

MOST of the eleven papers presented at a conference on ash and clinker in industry, which was arranged by the Institute of Fuel on Tuesday and Wednesday of this week, were closely related to combustion in electric power stations. The first, by Mr. L. F. Edgcombe and Dr. A. B. Manning (Department of Scientific and Industrial Research), outlined the origin and nature of the inherent and the unevenly distributed extraneous mineral matter in coal and discussed discrepancies between laboratory tests on ash having a fusion temperature higher than 2,200 deg F in a reducing atmosphere and its liability to produce clinker under working conditions. Such discrepancies were lessened with pulverized fuel owing to more even distribution and mixing.

Dealing with coal preparation, Messrs. A. Grounds and A. M. Wandless (National Coal Board) said that there were in Great Britain 520 geologically distinct seams in 26 coalfields. The average ash content, including dirt bands (containing 70 per cent of ash), was 10 per cent. Sulphur content varied from 0·5 to (exceptionally) 6 per cent, averaging 1·5 per cent. More important than the quantity of ash was its consistency and composition.

In a paper on the handling and disposal of ash, Messrs. W. G. Marskell and C. W. Pratt (Babcock & Wilcox) pointed out that coalescence rather than formation of fused particles caused clinker trouble. Shales (largely alumino-silicates) produced high-fusion-temperature ash, while compounds of high iron and calcium and inherent mineral content produced low-temperature-fusion ash. Fusion temperature was only one factor in clinker formation, which depended also on the nature and distribution of the ash, fuel-bed temperature,



Slag-tap furnace at Stourport "B" power station. *Left:* **Primary section showing lighting-up burners in wall, wall tubes insulated with plastic chrome ore, monkey ring for slag outlet drain and water cooled access door.** *Above:* **Lower part of wall of primary section opposite oil burners with slag screen and outlet through tubes to secondary furnace**

size and coking properties and disturbance of the fuel bed.

To simplify the cleaning of gases and the disposal of finely divided ash-forming material from pulverized fuel, slag-tap and cyclone furnaces (both described in the paper) had been introduced. The former retained about 50 per cent of the ash in the furnace and the latter 90 per cent. No commercial outlet had yet been found for pulverized fuel ash, but in certain areas there was a limited market for hard-core from mechanical stokers.

Causes of Fouling

The fouling of external heating surfaces of large boilers provided the subject of a paper by Dr. H. E. Crossley (British Electricity Authority), who referred to the vaporization of mineral substances in the coal in the furnace and the condensation of some of the vapours to leave relatively large concentrations on heating surfaces of substances which occurred as traces only in the coals. The evidence was less pronounced with pulverized fuel than with mechanical stokers for several reasons, among which were: the lower flame temperatures attained; the shorter combustion time (2 sec compared with 20 min with travelling grates); dilution by fly-ash (six to ten times the quantity found with mechanical stokers) of the concentrations; many inorganic compounds were more easily vaporized in the reducing conditions of fuel beds, but oxidizing conditions were found to persist throughout pulverized-fuel flames.

The commonest cause of fouling of boiler tubes was the bonding of fly-ash in an alkali matrix of inorganic salts, composed mainly of sulphates of sodium and potassium. The oxidizing action of acid sulphates had resulted in serious tube wastage where the final temperature of the steam reached 1,050 deg F.

Stoker-fired power stations suffering from alkali-matrix deposits were all in zones (Midlands, Lancashire and Yorkshire) where coals included a large proportion of chlorine, which ranged in this country from 0·01 to 1·0 per cent and exercised an influence which was more important than final steam temperatures or methods of operation. A few stoker-fired boilers burned coals with 0·8 to 1·0 per cent of chlorine without trouble, owing probably to the unusually low temperature (about 1,700 deg F) to which the gases were cooled before reaching the first deck of tubes, whereby the vapours of sodium and potassium sulphates were condensed to form a protective aerosol on the heating surfaces.

Boilers fired with pulverized fuel were free from alkali-matrix deposits in 1946, but in the following year trouble from this cause was experienced at the new Meaford station. Many of the coals burnt there were of high chlorine content and the weighted ash was only 8 per cent, as against 15 to 19 per cent at other stations where high chlorine coals had not proved troublesome.

Pulverized-fuel boilers had so far been immune from phosphatic difficulties and stoker-fired boilers had been involved only in regard to their economizers when phosphorus was present in considerable proportions, except at Battersea and Fulham, where superheater tubes had been affected. In both these cases coal was burnt in deep fuel beds at higher than usual temperatures. At Dunston disuse of high-phosphorus coals had enabled intervals between economizer cleaning periods to be reduced from three to twelve months with thorough cleaning only once in two years.

The surest method of alleviating fouling would be to allocate coals to plants in which they would be least likely to cause serious trouble, but at present shortage of supplies prevented this. In the meantime various methods were being tested at B.E.A. power stations, e.g., burning pulverized fuel above mechanical stokers, recirculation of flue gases with combustion air and humidification of combustion air.

Ash and Plant Design

In considering the effect of ash on the design of plant, Mr. W. F. Simonson (Water-Tube Boilermakers' Association) drew attention to the need to select a site which for a 300 MW station, using coal containing 20 per cent ash, would provide for the disposal of 4,000 tons of ash a week. The output of mechanical stokers was limited by constructional factors to 250,000 to 300,000 lb/hr. For the travelling-grate type the maximum ash content was about 15 per cent, not more than 30 per cent of which would pass through a $\frac{1}{8}$in mesh sieve; a minimum of 5 to 7 per cent ash was desirable to protect the fire bars. The

modern compartment type, however, had dealt with 35–45 per cent of ash.

High-ash coals called for lower combustion rates per sq ft of grate area to prevent undue carbon loss and shorter and wider grate areas to facilitate disposal of the ash. With the multiple-retort underfeed stoker, 20 per cent ash was the usual maximum but owing to its high fuel-bed temperatures, ash fusion temperature was critical and coals with a high phosphorus content were undesirable. The spreader stoker was claimed to prevent volatilization of ash constituents, but the method of coal feed involved an increased carry-over of grits, possibly resulting in abrasion of tube surfaces by recirculated gases.

Pulverized-fuel firing gave greater flexibility in dealing with variations in fuel quality, improved availability and adaptability to automatic control. High-ash coals, however, entailed increased mill capacity and lower rates of volumetric heat release with more liberal heating surfaces and consequently higher capital cost. They had been responsible for the abandonment of the purely radiant superheater in the furnace wall. Convection heat transfer surfaces at the immediate outlet from the combustion chamber were in the most critical situation as regards deposits. In the later boiler passes and in economizer and air preheater surfaces, condensation of volatilized ash constituents rather than the deposition of ash as such had to be guarded against.

Heat Losses from Ash

Ash in relation to boiler efficiency was discussed under two heads by Dr. A. C. Dunningham. The first covered the direct losses of heat in unburnt carbon and in ashes and the additional freight and handling charges. The second related to indirect losses through reduction of output and efficiency due to poor combustion arising from clinker formation, increased fuel-bed resistance or poor ignition and to longer outages and higher maintenance charges as a result of boiler deposits and corrosion. Broadly, the percentage of carbon in the ash when mechanical stoking was employed was the same as that of ash in the coal.

In 1945 the average cost of cleaning coal was 7s per ton, of which 5s was caused by loss of vend, and 7 per cent of combustible was lost in washery rejects. The cost had increased since then and it was an open question whether cleaning was economically justified in most cases. Methods of evaluating coal, including that devised by the N.C.B., were discussed and evidence was given that for each 1 per cent above 15 per cent of ash the heat loss increased rapidly.

Regarding the utilization of high-ash coals, Mr. F. B. Karthauser stated that 4 million tons of slurries (wet fines from coal preparation with a top size less than 1 mm) having representative calorific values of from 4,740 to 9,800 B.Th.U./lb were produced each year in Great Britain, about half of which was burnt at collieries in shell boilers, the rest being dumped in ponds. The National Coal Board was installing a 50,000 lb/hr boiler in North Wales which was designed to burn pond slurry at a rate of 40 to 50 lb/hr/sq ft of grate area.

Atmospheric Pollution

Mr. G. Fitton (Fuel Research Station, D.S.I.R.) pointed out that pollution of the atmosphere could not be assessed by the quantity of dust emitted from a chimney but rather from its effective concentration in the atmosphere, as determined by height of chimney, wind direction and strength and the contour of the surrounding area and buildings. High rates of combustion per unit grate area caused excessive grit emission, e.g., on raising the output of a boiler by 18 per cent (i.e., from its economic to its maximum rating), the dust concentration in the flue gas was increased by 250 per cent. With coal of a higher caking power the increase in concentration was only 100 per cent.

Differences between the several types of coal-fired gas turbine now being developed were said by Mr. F. T. Hurley (Fuel Research Station) to be largely determined by the methods adopted to deal with ash and its abrasive, corrosive and deposition effects. Even if cleaning by multi-cyclone dust arrestors proved sufficient, ash might considerably influence combustion chamber design. Experiments were proceeding with " dry " combustion chambers in which the ash was removed as finely divided particles, " wet " combustion chambers from which most of the ash was removed as molten slag, and two-stage combustion, in which the fuel was converted into producer gas and cleaned before being burnt.

ELECTRICITY IN THE AREAS

Modified Distribution Methods: Water Heating Load Control

SOUTH WALES

TARIFFS and rural development were subjects of major concern to consumers in the South Wales Electricity Board's Area last year. Many representations were made, through the Consultative Council, by farmers and others who were dissatisfied with the progress of electrification. In compliance with Government economic policy no new rural development schemes were introduced in 1951–52 and only 275 additional farms were connected. An essential preliminary, however, is the provision of high voltage mains to form the primary and secondary sections of the ultimate network in rural areas. The cost of such mains constructed during the year directly for rural areas was £113,000 and for both rural and urban areas £136,000. Further development of the agricultural region of West Wales will be made possible when the B.E.A. has erected its 132 kV line from Carmarthen Bay to Haverfordwest for which contracts have been placed.

The Board had to devote its resources in the main to urgent schemes of system reinforcement and extensive work of this nature remains to be done in many parts of the Area. During the year transformer capacity (excluding consumers' transformers) was increased by 82·6 MVA, including eight large transformers totalling 60 MVA in primary substations. To avoid reinforcing the d.c. networks, limited d.c. to a.c. conversions were carried out.

Industrial demand was less than anticipated, principally because the South Wales metal industries were not operating at full capacity, but sales to industry nevertheless increased during the year by 13 per cent; four-fifths of the electricity distributed is utilized in the mines and factories of the Area.

Every effort is being made to achieve economies. While the cost of electricity purchased rose by 0·039d/kWh, the Board's operational and administrative expenses increased by only 0·005d/kWh and the total revenue expenditure (excluding cost of purchase of electricity) decreased from 0·285d to 0·284d/kWh.

Non-statutory undertakings at Llanddewi Brefi, Llandissilio and Clynderwen were acquired during the year and mains supplies arranged in place of the existing small-scale generation.

MERSEYSIDE AND NORTH WALES

The average price received per kWh sold by the Merseyside and North Wales Electricity Board last year was 1·158d which, the Board's report points out, was only 11·6 per cent more than in 1938. Domestic consumers paid on the average £7 15s for the year, and the Board draws attention to the service received for this sum in terms of economy, comfort and saving of labour. No new increases in charges were authorized last year, though a standard domestic tariff was introduced in place of 147 existing rates. New consumers numbered 26,318; they included 981 farms, twice as many as in the previous year. Primarily because of a smaller expansion of industrial supplies, and conversions from trams to buses, the increase in sales was only 3·9 per cent.

The design of distribution systems for housing estates is now based entirely on methods developed by a panel of the Board's engineers and has resulted in a substantial reduction in capital costs. Recently a standard technique has been adopted for jointing medium voltage cable which has also brought a saving in material and cost. Progress has been made with the development of alternative standard designs of outdoor and indoor substations.

Reference is made in the report to the automatic control of the water heating load. The system now operated in the Board's Area is said to be the largest unit of consumer load control in the country and its effect is being closely studied.

YORKSHIRE

New industrial load connected last year by the Yorkshire Electricity Board aggregated 51,314 kW compared with 42,706 kW in 1950–51. One new plant near Sheffield for the production of compressed, industrial gases required an immediate 6,000 kVA

supply, with a possible future increase to 40,000 kVA. In addition, negotiations were completed with the National Coal Board for some 40,000 kVA of new and additional loads. Sales to industrial consumers represented 61·7 per cent of the total, a slightly smaller proportion than in the previous year. Supplies were given to a further 14,057 new houses (against 13,670), but the Board's rural development programme suffered a serious setback. Under the five-year plan it had been hoped to afford supplies to 272 villages by 31st March, 1952, whereas in fact only 185 received supplies.

Applications were received for the installation of several large arc furnaces which, with orthodox connections, would have imposed heavy current fluctuations on the system, with consequent voltage disturbances. The Board examined schemes for connecting this type of equipment in such a way as to avoid the use of plant solely for arc furnace loads.

Attention was given to reducing the use of copper; modifications introduced in the design of low voltage networks resulted in economies of the order of 20 per cent.

The length of h.v. and l.v. mains and cables commissioned during the year was 471 miles (against 568 in the previous year). The gross capital expenditure totalled £4,157,805 (£4,647,435). Approval was given to 2,216 schemes for the reinforcement and extension of the distribution system at an estimated cost of £3·9 million.

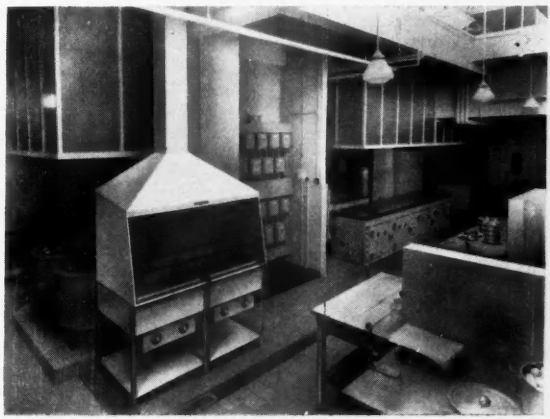
Sales of fittings and appliances during the year amounted to £1,450,000, an increase of 20 per cent, while the value of contracting work carried out rose by 35 per cent to £760,000.

ALL-ELECTRIC CANTEEN

Equipment at the G.E.C. Stanmore Laboratories

THE General Electric Co., Ltd., has built an all-electric canteen at its Stanmore Laboratories which can provide up to 700 meals during the lunch time period. The canteen is divided into two sections, a restaurant seating 70 and the main dining hall seating 130 persons. A common tea service is provided with access from both sections. The layout of the kitchen makes for economy of movement both within the cooking area itself and to and from the service counters. These counters, manufactured by Gardiner & Gulland, Ltd., comprise four plain top hotcupboards, one 7-pan service top hot closet, two 5-pan service top hot closets and a cold section. The counters are divided into two sections by a double cash desk.

The main cooking equipment is situated at the rear of the counters in a compact rectangle and grouped round three sides are various food preparation sections, stores, wash-up section, and staff cloak room. The cooking equipment is further divided into two groups, one containing the 20 gall vegetable boilers, steaming ovens, and fish fryer, the other providing the oven ranges, pastry oven, griller, bain marie,



General view of the canteen showing the two-pan fish fryer, isolating switch fuse panel and double-oven ranges

and 15 gall water boiler. Near the latter group is a service top hotcupboard for waitress service to the visitors' room. All isolating switch fuses are grouped in one neat panel at the kitchen centre.

The two G.E.C. 34 kW double oven ranges are thermostatically controlled. Their design, which provides for switches mounted on recessed panels which can be swung forward for servicing, has enabled them to be placed end to end to form a four-oven unit. The 2-pan 18 kW fish fryer has three-heat switch control, heating being by open coil elements beneath the pans. Additional G.E.C. equipment, already mentioned, includes two 9 kW steamers of 6 cu ft capacity, one 8 kW grill, a 6 kW bain marie, one 16 gall stockpot, a double-deck pastry oven with a loading of 7 kW per deck, a 12 kW water boiler and a 2 kW earthenware-lined urn for milk. A 14 kW café set was supplied by Stotts of Oldham, Ltd. There is also a 7 kW Hobart dish washer. Ventilation was planned by Hopes' Heating and Engineering, Ltd., to G.E.C. design. One amenity in the canteen is a G.E.C. sound equipment system.

"Terylene" Fibre

A LARGE factory, the first unit of which will cost more than £10 million and will be capable of producing some 11,000,000 lb a year of "Terylene" filament yarn and staple fibre, is now being built at Wilton, North Yorkshire. The plant is expected to commence production in 1954.

"Terylene" is a product of British research, and the registered trade mark is the property of Imperial Chemical Industries, Ltd. Chemically, it is a polyester fibre and the particular polyester from which the fibres are produced is polyethylene terephthalate, a condensation product of terephthalic acid and ethylene glycol. Both these substances are derived by chemical synthesis from products made by cracking mineral oil.

A description of its dielectric properties has been published with other physical data.* Its main advantage in electrical applications is that its electrical and mechanical properties are maintained at high temperatures (up to 180 deg C). Dimensional stability may be obtained at this temperature by a heat setting treatment. Tests made on smooth "Terylene" surfaces have shown that it is also non-tracking. As the absorption of moisture is small there is little effect on its properties from this cause. Applications now being developed for the electrical industry include insulating sheet, tape and twine, "wire lapping," braided covers for flexes and core threads.

* "The Dielectric Properties of Polyethylene Terephthalate" ("Terylene"), by Wilson Reddish. Transactions of the Faraday Society, Vol. 46, page 459, June, 1950.

Creep of Superheater Tubes

THE results of a determination of the extent to which the creep resisting properties of high temperature superheater tubes might be affected by commercial annealing treatments are set out in a paper which Messrs. D. C. Herbert and E. A. Jenkinson recently presented to the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne. The paper was a communication from the National Physical Laboratory where the creep tests were carried out for the British Electrical and Allied Industries Research Association, based on Report J/T 155.

Aluminium is commonly added to basic open-hearth mild steel, of small carbon content, employed for making superheater tubes in order to facilitate a rotary piercing. How much aluminium can be so added without deterioration of the creep properties is a question which has caused concern. Steel having 1 lb of added aluminium was found by the authors to be uniformly good in respect of creep resistance. Steel with 2 lb of added aluminium enabled tubes to be hot or cold drawn; they had good resistance to creep, but that resistance was considerably reduced by close annealing or normalizing heat treatment. Steel with 3 lb of added aluminium was generally poor in creep resistance both in bar and in tube form. Study of the microstructure of the steels mentioned did not assist in classifying them according to creep resistance.

Chemical Research

A REPORT of the Chemistry Research Board has been published for the Department of Scientific and Industrial Research under the title of "Chemistry Research 1951" by H.M. Stationery Office, price 4s 9d including postage. This report brings up to date the progress made by the Chemical Research Laboratory and directs attention to the services which it renders to industry. The laboratory is responsible, among other things, for the preparation and supply of organic compounds of guaranteed high purity as used for the calibration of mass spectrometers and as standards in physical methods of analysis. Stocks of 23 metals of great purity are held for issue to research workers at home and overseas.

New investigations include the study of corrosion in boiler tubes caused by the infiltration of sea water. Radio-active tracers are being used in an attempt to discover whether or not inhibitors form a film on metal surfaces. The electrode potential of steel specimens pre-immersed in the solutions has shown that there is a difference between the actions of chromate and benzoate.

Commerce and Industry

Import Licence Quotas

Census of Production Plans

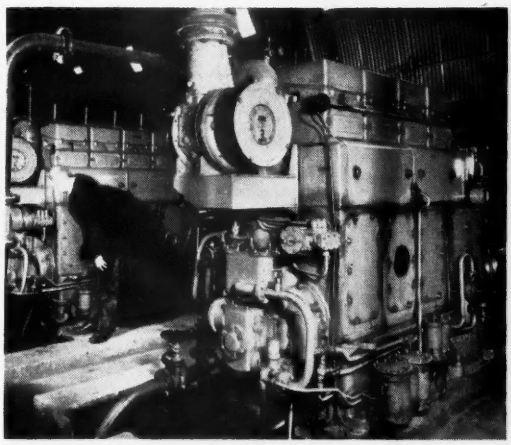
THE Board of Trade has invited importers to apply for licences to import during the first half of 1953 most of the commodities subject to the November, 1951 and March, 1952 (Budget) import cuts, and have announced the quota headings under which licences will be issued. The value of the quotas will be announced later. In allocating licences to individual importers, account will be taken of their imports of the goods concerned in previous periods. Importers will for most commodities be given the option of having their licences based on one of two past trading periods.

Full details are given in Notice to Importers No. 518, copies of which may be obtained from the Import Licensing Branch, Board of Trade, Romney House, Tufton Street, S.W.1. Applications for licences must generally be made not later than 12th November, 1952.

The schedules of goods subject to quota include a number of domestic appliances and lamps and lighting fittings.

Claerwen Dam

The new Claerwen Dam, which forms part of the Claerwen–Elan Valley water conservation scheme, was inaugurated by the Queen on 23rd October. The reservoir contained by the dam will augment the present Birmingham water supply. Power for the constructional plant on this project, which was started in September, 1946, has been obtained from a temporary generating station at the site. Among the equipment supplied for Claerwen were two English Electric diesel engines. These are four-cylinder turbo pressure-charged type 4SK engines, each giving a continuous output of 330 b.h.p. at 600 r.p.m., and having a bore and stroke of 10in and 12in respectively and a mean piston speed of 1,200ft/minute. The diesel engines were supplied to the order of Edmund Nuttall, Sons & Co. (London), Ltd., the main contractors for the scheme.



English Electric diesel engines installed in the temporary power station at the Claerwen Dam

Engineering Wages Claim

At a meeting in London last week the Engineering and Allied Employers' Federation offered the engineering trade unions a wage increase of 7s 4d a week for adult male workers. The reception of this offer was not favourable but the matter was to be considered at a meeting of the executives of the unions this week.

Telephone Managers' Salaries

A claim for increased salaries for telephone managers and deputy telephone managers recently went before the Civil Service Arbitration Tribunal. The present salary of the manager of the London Centre Area is £1,425 per annum; the claim was for £1,700 and the Tribunal awarded £1,500. The rate for other London areas was £1,285, the claim for £1,550 and the award £1,400. The corresponding figures for other managers are:—Class I.—£1,375, £1,650 and £1,500; Class II.—£1,225, £1,500 and £1,350; Classes III and IV.—£1,150, £1,350 and £1,250.

The existing rate for London and provincial deputy telephone managers is £1,150. The

claim was for £1,390 for London and £1,350 for the provinces. The Tribunal awards a uniform rate of £1,250 for all areas.

Large Arc Furnace

Birlec, Ltd., Erdington, Birmingham, has been commissioned by Samuel Fox & Co., Ltd., in association with the United Steel Companies, Ltd., to supply the largest arc melting furnace to be either manufactured or installed in Great Britain. This Birlec " Lectromelt " equipment will have a nominal capacity of 60 tons and will be rated at 15,000 kVA with on-load tap-change gear. Samuel Fox & Co. will install this unit at their Stocksbridge works, where it will be used for the production of high quality alloy steel ingots.

Safety and Efficiency Exhibition

The Birmingham Industrial Safety Group is holding a Coronation Year Exhibition in the Bingley Hall, Birmingham, from 19th to 26th June, 1953. This exhibition will follow the pattern of the exhibition which was organized in Festival year. The scope is being extended to cover all aspects of safety, efficiency, and health in industry. On this occasion the whole of the Bingley Hall has been booked, and to coincide with the exhibition a week-end conference is being organized with emphasis on the theme of training for safety and health in industry.

Ships' Electrical Engineers

At the annual meeting of the Navigators' and Engineer Officers' Union in London a resolution was passed pressing for separate certificates for electrical engineer officers to establish their position in view of their increasing responsibilities.

Transformers for Venezuelan Vessels

Three destroyers are being constructed at Barrow for the Venezuelan Navy and the first is due for launching on 19th November. The lighting in these ships is at 110 V and the supply is obtained by stepping down the ships' main 440 V three-phase supply. The transformers for this purpose are being provided by Stewart Transformers, Ltd.

Censuses of Production

An Order indicating the scope of the Census of Production to be taken in 1953 for the year 1952 has been made by the Board of Trade. The Order, which operates from 31st December, 1952, is the Census of Production (1953) (Returns and Exempted Persons) Order, 1952 (H.M. Stationery Office, price 2d). Sampling will be used in the census for 1952 for the first time. The use of sampling methods is facilitated by the fact that details of output and the usage of certain materials were obtained in the census for 1951. The adoption of sampling methods will relieve a large proportion of the smaller and medium-sized establishments of the need to make a return. Moreover, fewer questions will be asked than in any previous census.

The Census of Production to be taken in 1954, in respect of the year 1953, will be on the same simplified basis as that adopted for the previous year. The censuses for 1952 and 1953 will cover all producing industries and returns will be required from all firms over a certain size in each trade. From the information obtained early estimates will again be made of certain important aggregates such as total sales, materials used, stocks, and capital expenditure for each trade.

Graduates for Industry

Twenty-five university appointments officers, representing fifteen universities in Great Britain with science and engineering faculties, assembled in Birmingham for a recent two-day conference organized by the General Electric Co., Ltd. The purpose was to acquaint them with the present needs of the British electrical engineering industry and to examine problems of recruitment, training and employment of graduates. Information was given of the wide scope for science and engineering graduates within the company's organization. The conference was held at Castle Bromwich Hall, one of the company's hostels for apprentices, and Mr. F. R. Livock, staff manager of the G.E.C., acted as chairman. The speakers included Mr. P. C. Hordern (Birmingham University), Mr. J. J. Gracie (G.E.C.), Mr. O. H. J. Dick (Glasgow University), Mr. W. N. C. van Grutten (Cambridge), Professor E. Zepler (Southampton) and Mr. C. E. Escritt (Oxford).

Motor Show Luncheon

Speaking at the annual Exide Motor Show luncheon on 22nd October Mr. H. V. Schofield, sales director of Chloride Batteries, Ltd., said that the major control affecting the company had gone and with its going there had been a dramatic reduction in the price of the one commodity essential to their business. Who would have said, nine months ago, with lead at £185 per ton, that to-day it would be possible to buy it at £80–£85 per ton? Did not that drive home the fact that lots of these controls were quite unnecessary and that once control was taken off an article there was a reduction of price? When a control was imposed, for some reason the product became scarce; when it was taken off, then there was apparently enough and to spare. The company had, of course, followed the fall in lead prices by a reduction in prices to the public.

Telephone Service Arrears

At 30th June last there were 468,461 outstanding applications for telephone service. This was a decrease of 50,260 since June, 1951.

At the same date, the number of telephones in use throughout the country totalled 5,773,015, which was an increase of 263,761 over the previous year. The number of shared service subscribers at 30th June was 494,654; of these, 107,142 were business subscribers.

Ship-to-Shore Television

The ship-to-shore television experiment recently carried out by the B.B.C. in collaboration with British Railways, Southern Region, yielded promising results. Transmissions were commenced from the *Lord Warden* on 16th October, some 3½ miles outside Boulogne and reasonably satisfactory signals were received at Swingate during the entire journey to Dover, although a certain amount of interference from other transmitting stations was experienced.

Further tests were carried out on 17th October during both the outward and homeward crossings and these tests indicated that provided certain precautions were taken there was every reason to believe that satisfactory pictures could be obtained from the *Lord Warden* next spring.

Enfield Cables' Welsh Factory

The increased demand for its covered wires necessitated the acquisition by Enfield Cables, Ltd., of a new factory, and towards the end of last year a new Board of Trade factory of 15,000 sq ft floor area was taken over at Forgeside, Blaenavon, Monmouthshire. A quick transfer from Brimsdown was essential to avoid a lengthy break in production, and this was accomplished in about a fortnight. Mr. W. Turner, the covered wires shop foreman at Brimsdown, was appointed manager of the new factory and key workers, who were lodged locally, moved to Blaenavon simultaneously with the plant. To save time, the Croid-Cooper technique for the installation of plant was used. Instead of bolting it direct, felt was glued to the concrete first and the machinery was then glued to the felt. Local labour was recruited, and the factory was in production within a month. Sales are still handled from Victoria House, Southampton Row, London, W.C.1, whence contact with the factory is maintained by teleprinter. An exterior view of the new factory is shown in the accompanying picture.

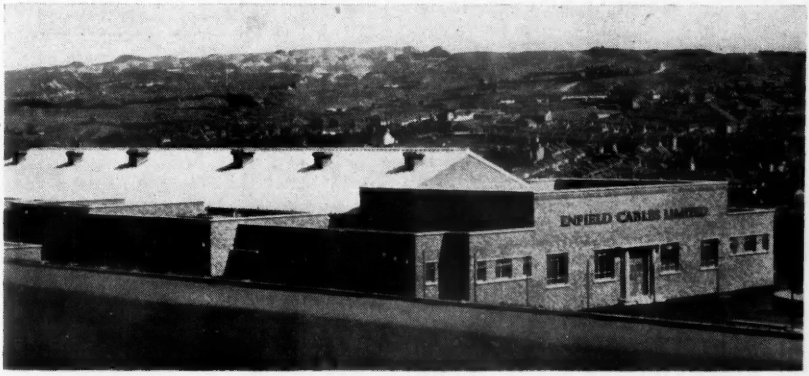
Iron and Steel Allocations

The Ministry of Supply announces that from 1st January no distinction will be made in allocation between alloy iron and steel and non-alloy steel. Consumers will then be free to choose how much of either material—within their total authorized tonnages—they wish to acquire instead of having amounts specified for each. There will be an exception—tinplate, terneplate and blackplate—which will remain separately allocated as at present. Those who already hold authorizations for periods in 1953 for alloy and non-alloy materials separately will shortly receive authority to treat them as applicable to either type of material.

Warning to "Dabblers"

The Bradford *Telegraph and Argus* of 24th October published a plea for an all-out home-safety campaign in the field of safe electricity by Mr. Harry Moss, M.I.E.E., the well-known Bradford contractor. Citing the recent case of a girl in the South of England who had been killed by touching a home-installed electrically-heated towel-rail while standing in a bath, he said that 40 to 50 people were killed each year in this country through similar accidents. He stressed that electrical work should be done only by those who had been carefully and

The new covered wires factory of Enfield Cables, Ltd., at Blaenavon



efficiently trained. It was not work for the "dabbler" or the amateur.

Speed Measurement by Radar

The annual report of the North-East Coast Institution of Engineers and Shipbuilders referred to the use of radar to determine the speed of a ship by using the ship's radar in conjunction with a radar buoy moored at the northern end of the course. This is stated to be the first time a ship's speed had been ascertained by radar. The report stated that further trials of a prototype apparatus had been carried out on the Newbiggin course by the British Shipbuilding Research Association with an improved radar reflector mounted on the buoy at the northern end of the mile. The new reflector had simplified target identification and greatly reduced the fading of the target echo.

"Model Engineer" Exhibition

The extension of the use of radio control was a striking feature of the "Model Engineer" exhibition opened by the Duke of Edinburgh at the New Royal Horticultural Hall, Westminster, last week. Apart from six radio controlled aircraft in the competition section there were special demonstrations, in a large tank, of a radio controlled, electrically powered model of H.M.S. *Diana*, with all its guns elevating and swivelling, torpedo tubes swinging to port and starboard, and depth charges being dropped. Included in other electrical items among the 400 competition models were a battery electric delivery van, a colliery winding engine, a battery operated clock and an electronic organ.

In the trade section displays were largely devoted to lathes and other fixed and portable electric tools specially suitable for model engineering, the exhibitors including Black & Decker, Ltd., Buck & Ryan, Ltd., the Burnett Machine Tool Co., Ltd., E. W. Cowell, W. H. Haselgrove, Myford Engineering Co., Ltd., and S. Tyzack & Son, Ltd. A portable electric welding and soldering unit was shown by Donald Ross & Partners, Ltd. On the Chloride Batteries stand a selection of "Exide" cells and "Drydex" dry batteries combining high capacity with low weight represented the range available for powering models of all types. Scale model electric trains, etc., formed the Graham Farish display. Radio control units made specially for model aircraft, boats, etc., were demonstrated by Electronic Developments (Surrey), Ltd.

New Ekco Posters

Three new crown posters are now available to authorized dealers of television sets made by E. K. Cole, Ltd. Printed in colour and with the familiar Ekco "page-boy" and "page-girl" corners, two of them summarize the advantages of the 132 sq in and 85 sq in picture area sets.

New "Ekcovision" crown posters

The third deals with the improvements effected by "spot-wobble."

G. & J. Weir Acquisition

The directors of Coltness Iron Co., Ltd., have accepted an offer from G. & J. Weir, Ltd., Cathcart, Glasgow, for the purchase of their foundries and certain ancillary departments at Newmains. It is understood that G. & J. Weir intend to continue the foundries in operation.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £87 10s 0d
Foreign	ton £86 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £951 0s 0d
ZINC, G.O.B. Foreign	ton £118 0s 0d
Electrolytic	ton £122 0s 0d
BRASS Tubes	lb 2s 3d
Sheet	lb 2s 5¾d
Wire	lb 2s 8¾d
PHOSPHOR BRONZE	
Wire	lb 4s 1¼d
RUBBER, No. 1 R.S.S. spot ..	lb 21¼–22¼d

New "Sunco" Catalogue

A worthy successor to the "Sunco" general catalogue, last published in 1936, is the 400 page priced catalogue of installation supplies, now available from the Sun Electrical Co., Ltd., 118–124, Charing Cross Road, London, W.C.2. It does not deal with domestic appliances, heating material, lighting fittings, etc., for which there are separate publications. Two new sections deserve special mention, one

devoted to " Pyrotenax " cables and the other dealing with electricians' tools. A schedule of revised prices for use in conjunction with the catalogue is also available (List No. 800).

Wholesalers' Annual Dinner

The annual dinner of the Electrical Wholesalers' Federation is to be held on 19th March next at the Dorchester Hotel, London, W.1.

Coronation Lighting Equipment

The General Electric Co., Ltd., now has available a complete range of lighting devices, floodlights, and ancillary electrical equipment appropriate to the Coronation festivities. It has in addition appointed Beverley Pick Associates, the industrial design consultants, to advise on and prepare schemes of decorative illumination for the Coronation.

Special decoration lamps produced by Ekco-Ensign Electric, Ltd., include red, white and blue fluorescent lamps, small tungsten decoration lights, and a 5 W neon lamp with the electrodes in the form of the letters " E.R."

A leaflet has been specially produced by the Simplex Electric Co., Ltd., to assist sales of floodlighting equipment in Coronation year.

Trade Announcements

Building work has now begun on a site adjoining the main offices and works of **Birlec, Ltd.,** at Tyburn Road, Erdington, Birmingham, which will provide additional drawing office and other facilities, whilst similar work at the other end of the factory will lengthen the existing works bays.

Boneham & Turner, Ltd., Mansfield, announce that a change has been made in the trade names used by their electrical lamination manufacturing branch (Field Mill Works) to denote the quality of material used by them for electrical sheets and stampings. In future their new trade name " Dy-Sil " will be given to the quality of material previously known as " Lo-Sil," and accordingly their laminations will now be supplied in " Hi-Sil," " Me-Sil " and " Dy-Sil " qualities.

The **Simplex Electric Co., Ltd.,** has closed its Newcastle-on-Tyne branch at Carliol Square, and has opened a branch at Kent House, Church Street, Gateshead-on-Tyne. The new premises include offices and a large storage centre permitting the company to carry greatly increased stocks. A showroom will be opened shortly.

Smart & Brown (Engineers), Ltd., have acquired the sole selling to the electrical trade of the " Darnalite " plastic darning mushroom throughout the whole of the United Kingdom.

Mr. N. B. Croft, 12-14, St. George's Street, Belfast, Northern Ireland, has been appointed by **Dimplex, Ltd.,** as its agent for Northern Ireland.

Catalogues and Lists

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—Broadsheet AL/96E and fluorescent lighting handbook AL/104A giving details and reduced prices of " Atlas " fluorescent lighting fittings and control gear.

Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2.—Revised price lists covering a range of industrial and commercial fluorescent lighting fittings.

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—64-page priced catalogue illustrating decorative lighting fittings and a special Coronation illumination and floodlighting equipment supplement (795-52).

Metropolitan-Vickers Electrical Co., Ltd., 1-3, St. Paul's Churchyard, London, E.C.4.—32-page priced general lamp catalogue.

The D.P. Battery Co., Ltd., Bakewell, Derbyshire.—24-page illustrated booklet dealing with " D.P. Kathanode " diesel engine starting batteries (DP.816).

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—Technical brochure on the D431 unit type motor control and distribution gear (601).

London Transformer Products, Ltd., Cobbold Estate, Willesden, London, N.W.10. —Catalogue illustrating a range of power and distribution transformers up to 2,500 kVA, 33 kV.

Test Gear Components (London), Ltd., 134g, Kingsland Road, Shoreditch, London, E.2.—Illustrated folder giving a selection of wire-wound resistors.

Pressed Steel Co., Ltd., Cowley, Oxford. —Two catalogue sheets dealing with the L.H.V.P. 65/8 sub-stratosphere cabinet (Z116) and lollipop freezers (Z130).

Standard Telephones & Cables, Ltd., Rectifier Division, Warwick Road, Boreham Wood, Herts.—Illustrated leaflet featuring the " Home " battery charger (F/HC1).

British Thomson-Houston Co., Ltd., 18, Bedford Square, London, W.C.1.—Illustrated booklet on photoflash bulbs (L.919).

Alliance Wholesale, Ltd., 24/30, Gillingham Street, London, S.W.1.—Comprehensive domestic electrical appliance catalogue, with index (497).

Hailwood & Ackroyd, Ltd., 18, Lowndes Street, London, S.W.1.—List CF.52 illustrating a comprehensive range of " Hailware " commercial lighting fittings (priced).

Enfield Cables, Ltd., Victoria House, Southampton Row, London, W.C.1.—Revised edition of the " Grid Suspension " wiring system catalogue which incorporates information about a new connection box (EN.108).

Research into Illumination

Developments in Measurement Technique

THE contribution of research to progress in the lighting art was indicated by Dr. J. W. T. Walsh in his inaugural address as chairman of the Utilization Section of the Institution of Electrical Engineers in London on 23rd October.

He said that during the last two decades there had been three outstanding developments in measurement. One was the introduction of a primary standard of light in the strict sense of the term, but not till 1931 did the U.S. Bureau of Standards succeed in realizing such a standard in the form described in the address.

The second development referred to was the establishment of a photometric scale that was applicable to light of any colour and independent of the characteristics of an individual observer, so that photometry could be reduced to a purely physical measurement.

Colour Measurement

The third development commented on was the establishment of an international system of colorimetry which, again, was independent of the vagaries of the human eye so that a colour could be measured objectively with the aid of an instrument similar to, or the same as, that suitable for physical photometry. Thus both photometry and colorimetry had been endowed with a precision and universality which they could not have had so long as they were dependent on visual methods of measurement.

Turning next to research which had had for its object the betterment of methods of using light, the chairman recalled the work of Rumford, Preece and Trotter and the need for "management" of the light provided by available sources, an outstanding example being the necessity for most economical management of the meagre light usually available for street lighting. Only within the last two years had a Code of Practice emerged to guide the street lighting engineer.

In connection with the development of a logical method of arriving at the values of illumination to be recommended for particular kinds of work, the Weston experiments, which were briefly explained in the address, had shown that there was a value at which performance reached the maximum, while at considerably lower values the performance was still a high percentage of the maximum. Weston therefore proposed that the value to be recommended for a particular task should be that at which performance was some definite percentage of the maximum. He suggested 90 per cent and the Code of the Illuminating Engineering Society in this country was constructed on that basis.

It was, however, realized that that high standard of visual performance might not be adopted in other countries because, on economic grounds, the higher the cost of labour compared with that of illumination, the higher should be the percentage selected for working out Code values; 90 per cent might even cease to be appropriate to this country if labour cost increased more rapidly than the cost of providing a given illumination.

Since light to-day cost, in terms of real values, less than one-thirtieth of what it did only 35 years ago, it was not surprising that illuminations now recommended and used should be five to ten times what they were before 1914.

Other directions in which research was coming to the aid of lighting engineers were in helping them to find out how to design a lighting system so as to produce a sense of comfort and general well-being and to study colour appreciation.

I.E.C. in Holland

Referring to our report of the meeting in Holland of the International Electrotechnical Commission (*Electrical Review*, 26th September), the Austrian National Committee informs us that Dr. G. Poppovic, who appears in the group photograph on page 697, is vice-president of the Austrian Committee and not a representative of Yugoslavia, as stated.

Railway Delivery Work

Experiments with Electric "Horses"

One of the British Railways' electric "horses" with its trailer

FOR some years the railway authorities have been replacing the horse for collection and delivery work by motor vehicles, including mechanical "horses" of which about 8,000 are now in service.

British Railways have recently been examining the possibilities of battery-operated electric "horses" and, with the co-operation of Austin Crompton Parkinson Electric Vehicles, Ltd., a hundred of these are in experimental operation in sixteen cities and towns throughout the country. Twelve of them have been working successfully in Hull and a demonstration was given in that city last week.

The electric horse is a four-wheeled articulated tractor working with standard mechanical-horse trailers, the coupling being interchangeable. Nominally a 2-tonner, it can carry a 2½ ton pay-load. Its normal range is 25 miles per charge and its maximum speed loaded and on the level is 18 m.p.h. The unit can climb a one in nine gradient with a full load.

The vehicle has an overall length of 13ft 2in, a width of 6ft and is 6ft 10in high. The wheel base measures 5ft 11½in with a front wheel track of 5ft 1in and a rear wheel track of 4ft 7in. The unladen weight with battery is 2 tons 4 cwt; without the battery it is 1 ton 3 cwt.

The 12½ h.p. (1-hour rating) 90 V motor is operated by a five-stage solenoid-contactor type controller, operated by an automatic delayed-action foot switch giving five forward speeds and reverse, sequence controlled. There is a hand-operated switch for selecting forward or reverse.

A specially-armoured 200 Ah (5-hour rating) traction battery is mounted in two crates suspended one on each side of the frame.

British Standards

Bayonet Lamp Caps, Lampholders and Adaptors.—B.S. 52 for bayonet lamp caps, lampholders and lampholder plugs (b.c. adaptors) for not more than 250V has been revised, but not fully, to give effect to certain changes in practice and to take account of international agreements arrived at by the I.E.C. The opportunity has also been taken to include additional types of bayonet caps used in the automobile industry, while the tables have been enlarged to accommodate the metric equivalents of the dimensions previously quoted in inches only.

Flexible Conduit.—Since flexible conduit for protecting electric cable has become dissociated from flexible steel tubing for enclosing flexible drives, the latter will need a separate standard specification, to be issued shortly under a new B.S. number. Meanwhile Part 1 of B.S. 731 has been revised to provide for the protection of three types of insulated cable (unpacked, asbestos packed and rubber packed) and for two types of adaptors (clamp and solid). It standardizes dimensions, specifies mechanical requirements and tests and prescribes materials to be used.

Lead/Acid Batteries (Non-Aerobatic) for Aircraft.—B.S. 2G.131 has been revised to allow for a battery of higher discharge rate and for an alternative terminal arrangement.

The above documents (5s, 2s 6d and 2s respectively, including postage) are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1.

New Books

Rewinding and Repair of Electric Motors. By K. Wilkinson. Pp. 208; figs. and index. E. & F. N. Spon, Ltd., 15, Bedford Street, London, W.C.2. Price 20s.

The aim of this book is to explain the various processes which may be involved in the rewinding of d.c. and a.c. motors up to about 50 h.p., from the receipt of the motor to the final tests. After describing the different types of windings the second chapter is devoted to the important work of recording the data from the defective winding. This operation is often not carried out with sufficient care and as a result there may be considerable difficulty at a later stage and a faulty repair.

The following sections explain the process of stripping out defective windings, making small insulating parts, formers, coil jigs, straightening of shafts, hand and automatic coil winders and technique. Separate chapters explain the various types of stator and armature windings. A most useful section of the book is the one which covers the methods of testing for various types of faults on armatures, field, stator, squirrel-cage and slip-ring rotor windings, and which deals with the use of growlers, volt drop tests, search coils, etc. The book concludes with a chapter on varnishing and assembly, bibliography, index and eight photographs of winding processes.

The author has mainly confined his attention to the practical aspects of such repair work as may be required in copy rewinding and does not deal with motor design or the calculation of turns. The book is well illustrated and clearly written so that it can be understood by those without advanced technical knowledge. It should be useful to all persons concerned with windings and electrical repair work.—J.L.W.

Electrical Engineering, Theory and Practice. By W. H. Erickson and N. H. Bryant. Pp. 523; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 48s in the United Kingdom.

This excellent American book strikes a new note in that recognizing the importance of electricity in all branches of industry, it is written not for the electrical engineer but for mechanical, civil and chemical engineering students. The authors are associate professors of electrical engineering at Cornell University, the book being based upon their lecture notes, and they state that the reactions of their students to the lectures as well as the results achieved have been most encouraging. Indeed, they go so far as to express in the preface their indebtedness to those students who have helped in the development of the book by their patience, suggestions and encouragement.

The contents are classified in three sections, viz., circuits, machines and electronics, the treatment, broadly speaking, covering the syllabus of the general examination in electrical engineering of our own Institutions of Mechanical and Civil Engineers. Both d.c. and a.c. circuits are discussed before any consideration is given to machine details, and in addition to the ordinary d.c. and a.c. machinery, the general theory and applications of synchro units and rotary amplifiers are included. The chapters relating to electronics are intended to serve as an introduction to the ever-increasing number of applications of electronics in industry.

For those electrical engineers who would welcome the opportunity of revising the theory of their subject from a new angle and who are intrigued by the fine work done in the engineering world by their American cousins, this book can be thoroughly recommended.—A.R.

Books Received

Vacuum Technique. By Arnold L. Reimann, Ph.D., D.Sc. Pp. 449; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 50s.

Direct Current Machines for Control Systems. By A. Tustin, M.Sc., M.I.E.E. Pp. 306; figs. and index. E. & F. N. Spon, Ltd., 15, Bedford Street, London, W.C.2. Price 50s.

Motor Transport Cost Tables and Fuel Consumption Cost Reckoner. Pp. 32. Published for *Motor Transport* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 1s (postage 2d).

Autocar Road Tests 1952. Reports on the road performance of thirty current British, American and Continental cars, compiled by the technical staff of *The Autocar*. Pp. 96. Iliffe & Sons. Price 5s (postage 4d).

ELECTRICITY SUPPLY

Rural Electrification Methods

Water Power Eases Fuel Position

THE Electric Power Committee of the United Nations Economic Commission for Europe (E.C.E.) is seeking to discover the best methods for the electrification of various kinds of agricultural regions. Knowledge of these methods should be of particular use to countries where rural electrification is less developed, and it should also serve as a guide to all other countries.

Towards this end, the Committee called for a study which would include four related parts: production, distribution and transmission, utilization, and economic, financial and administrative questions. It also suggested methods for realizing the study.

A preparatory stage consisted in collecting reports, based on a common plan. Fourteen monographs indicating the results of experience in individual countries have been received to date. The drafting of a general study has been assigned to four experts who began in Geneva last week their work which is expected to require two months of continuous effort. The four experts are Mr. C. A. Cameron-Brown, agricultural electrification adviser, British Electricity Authority; Mr. M. A. Dussarte, honorary controller-general, Electricité de France; Mr. F. Ringwald, director of motive power, Central Switzerland; and Mr. T. R. A. Strand, director of the regional administration of Alvkarleby, Sweden.

A study group commenced a three-week session in Geneva this week for a broad exchange of views on the various aspects of rural electrification in countries at different stages of industrialization. It will enable the four experts to gather supplementary information to facilitate their work.

Education Authorities Criticize Board

A conflict has arisen between education authorities and the North Eastern Electricity Board regarding the Board's charges for supplying electricity to new schools. Councillor P. H. Edwards, chairman of Newcastle Education Committee, said the Board had asked for a contribution of £1,945 towards the capital cost of supplying Denton Square Primary School. This was several hundred pounds more than expected. He added that the terms for this type of work varied from district to district in the Board's area. Mr. H. M. Spink, director of education for Northumberland, said that the matter was being investigated by the Association of Education Committees. There was a considerable difference between the terms of the North Eastern Electricity Board and those of the S.E. Scotland Electricity Board, which were much lower.

Commenting on the matter, a representative of the North Eastern Electricity Board said that schools were treated the same as other consumers. There was a free allowance of overhead and underground cable and the education authorities were asked to bear the rest of the cost. High charges were sometimes necessary owing to the fact that new schools needed plant to carry heavy loads. On the other hand the Board's revenue from such installations was small.

Power Charge Refund

The Town Clerk of Bradford reported to the Corporation Transport Committee last week that the Yorkshire Electricity Board had agreed to refund over £30,000 for the year 1950–51 as a rebate on electric power charges for the city's transport system. This amount was based on the difference between the reduced quantity of power used when the last tram service in Bradford was discontinued and the minimum charge which previously existed. The Board did not admit liability but wanted to arrive at a settlement fair to both parties. The Committee decided to express its appreciation of the way in which the Board had dealt with the claim.

B.E.A. Temporary Borrowings

The Treasury has issued a statement of guarantee in respect of temporary borrowings by the British Electricity Authority. It covers an amount not exceeding £55 million for the period ending 31st October, 1952.

Coal Saving

New hydro-electric stations now operating in Scotland have saved the country the embarrassment of importing coal from overseas. This tribute to the hydro-electric projects in the Highlands was paid recently by Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, in his review of the fuel situation. There was no doubt, he stated, that the overall saving in solid fuel in Scotland compared with last year was due to the increase in the supply

of electricity to consumers in the area covered by the North of Scotland Hydro-Electric Board. Had it not been for this substantial aid to the economy of Scotland, because of the decrease of 180,000 tons in coal production, we should have required to import supplies for winter consumption from other countries.

Power for Black Isle

Proposals for providing electricity to approximately 130 premises in the widely-scattered districts of Newton of Kinkell, Muir of Allangrange, Drynie Park, Muir of Conon and Balvaird were outlined at a public meeting in the Black Isle by Mr. R. B. Anderson, area manager, North of Scotland Hydro-Electric Board. The basis of the scheme was that consumers would undertake to use electricity to the value of £3 per room each year. Mr. Anderson explained that these favourable terms could only be offered if the majority of the premises were dealt with at the one time. The meeting voted unanimously in favour of the scheme.

Turkish Scheme

A note from a correspondent published in our issue of 12th September referred to a new hydro-electric station at Catalagzi in north-western Turkey. Actually the station concerned, a steam plant containing three 20 MW Metrovick sets, has been in operation for some time. The new equipment recently put into operation consisted of a 150 kV transmission line with substations at Eregli, Izmit and Istanbul.

Transfer of N.C.B. Network

Stanley (Co. Durham) Urban District Council has been in touch with the North Eastern Electricity Board regarding the supply of electricity to Council houses at Craghead at present served only by gas. In reply, the Board states that agreement has been reached in principle for it to take over from the National Coal Board the distribution of electricity in certain areas. Before doing so a scheme must be prepared for modifying the networks to meet modern conditions. This work will be of considerable magnitude and will take about five years to carry out, subject to the availability of capital and materials. The Board has promised to inform the Council when the Craghead area will be dealt with.

New Ontario Station

The Premier of Ontario (Mr. L. M. Frost) recently officially inaugurated the Otto Holden generating station, the third to be built on the Ottawa River within two years. Formerly known as the La Cave development, it has been renamed as a tribute to the assistant general manager (engineering) of the Ontario Hydro-Electric Power Commission, Dr. Otto Holden. The main dam is one of the largest in the province, being 2,500ft long and having a maximum height of 130ft. Housing eight units with a total capacity of 192 MW, the power-house forms an integral part of the main dam structure. The project has cost $60·3 million.

Installations in Council Houses

Electricity is to be installed in all Council houses at Halstead, Essex.

Felling-on-Tyne U.D.C. has deferred for the time being proposals for installing electricity in houses on the Stoneygate Lane estate, Felling. The work is estimated to cost £3,378.

Flashing Beacons in Birmingham

The estimated cost of the equipment for the installation of flashing lights on the beacons at the 437 controlled pedestrian crossings in Birmingham is £22,000. In addition, the annual maintenance cost, including the electricity consumed, is estimated at £5,000.

Coronation Illuminations

The Yorkshire Electricity Board has been asked to give an estimate of the cost of floodlighting several buildings in Holmfirth, including the "Flood Memorial," in connection with the Coronation.

Rewiring of Police Offices

Because the Midlands Electricity Board has reclassed the many police offices which are part of police houses as business premises Warwickshire County Standing Joint Committee has decided that more than 100 police houses in the county will have to be rewired and metered. The cost of rewiring is estimated at about £1,000 and the increased cost of electricity to these offices may amount to £500 a year.

Exchange of Students

THE fifth annual report of the International Association for the Exchange of Students for Technical Experience, which has just been published, shows that altogether 24 British universities and colleges now co-operate in this project. Through the central office at Imperial College, London, 488 students were sent overseas in 1952, an increase of 66 over the corresponding figure for 1951, and in return 602 overseas students were received for experience in British industry and commerce.

There are now 17 countries participating and it was possible on an annual income of £462 to include a total of 3,490 students in the programme during last summer. It is anticipated that Canada will take part in the exchange next year.

Motor Show

Electrical Appliances for the Modern Garage

WITH only minor innovations in the electrical equipment in the cars themselves, electrical interest at the Motor Show now being held at Earls Court, London, centres largely on the components and accessories and on appliances now available for facilitating maintenance and servicing.

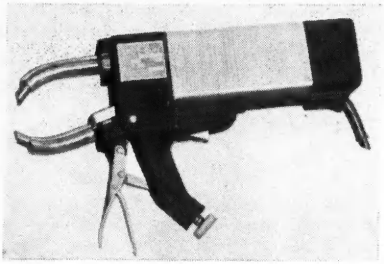
To enable those driving at night to have a better view of the road ahead, thus increasing road safety, Joseph Lucas, Ltd., introduces to the home market a new auxiliary headlamp nicknamed the " Flame-thrower." Intended for use only with head-lamps, it is designed for control by normal " dip " and " switch " mechanism to ensure that its narrow projection of light is switched off when the headlamp beams are in the " dip " position. A display unit illustrates its operation and there is also a demon-stration showing the efficiency of the Lucas " double-dipping " headlamp system now fitted as standard on the majority of new British cars and also available, by means of conversion sets, for the older cars. All the Lucas foglamps are now fitted with the new " block-lens."

Both new fog and tail lamps are shown by Butlers, Ltd. On the Desmo stand a shallow hinged tail light accompanies a new wide-beam farm-light lamp. A stop-tail lamp shown by the Wico-Pacy Sales Cpn., Ltd., has twin filament bulbs. A comparison of French car lighting equip-ment with British is provided by two displays arranged by Marshal Distributors, Ltd., and S. Guiter-man & Co., Ltd. (" Cibie "). The " Nobby " time switch for car side and rear lights is obtainable from William Clark (Spare Parts), Ltd. Portable electric safety lamps for use in explosive atmospheres are shown by Ceag, Ltd.

Besides lighting equipment, a complete range of other electrical components and accessories is to be seen on the Lucas stand, including " Windtone " horns, ignition interference suppressors, windscreen wipers, distributors, magnetos, a sports coil, a new trafficator, defrosters, batteries and a battery filler. Among C.A.V. electrical equipment are totally enclosed generators, starters and batteries for marine duty, switchboards and control boards for charging and lighting equipment, and searchlights for motor launches, etc.

Other new electrical components include the Wico-Pacy series 81 " C.J." magneto, the Commercial Ignition Co.'s " C.I." speed coil, the Delco-Remy-Hyatt oil-filled ignition coil and the Trico-Folberth direc-tion indicator with positive " return to

Partridge Wilson " Davenset " model R combined fast and normal battery charger and (*right*) new version of the Crypton " Thermo-safe " fast charger



"Triangle" spot-gun portable welder

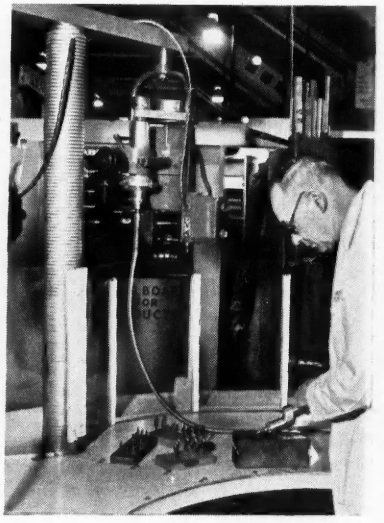
case" feature. Car fans and automatic cigarette lighters are also shown by the last-mentioned company. With the new Simms SPE.4A fuel injection pump are lamps, starters, switches, control boards, instrument panels, etc. E. K. Cole, Ltd., exhibits its full range of car radio receivers and equipment.

The range of Exide "Double-life" batteries, which incorporate dual separation of the plates, polystyrene baffle vent plugs and other notable features, has been augmented to meet the requirements of every make and type of car. Like the Peto & Radford "Dagenite Dual-life" batteries they carry a guarantee of two years' life or free replacement. A new 12 V battery for the Ford "Consul" and "Zephyr" cars is among typical batteries shown by the Young Accumulator Co., Ltd., whose marine batteries have a special shockproof construction to withstand severe vibration. The new "Superclad" heavy marine battery for starting and lighting is introduced by Park Bros., Ltd. A full range of batteries is also shown by Tungstone Products, Ltd., the Edison Swan Electric Co., Ltd., and Oldham & Son, Ltd., the last two companies also including chargers in their displays.

Though primarily designed for the rapid charging of batteries, the new "Davenset" model R two-way charger brought out by Partridge Wilson & Co., Ltd., will also charge all sizes of batteries at the normal rate. Thermostats and a tripping device afford complete protection to both rectifier and battery, it being impossible for either to be damaged by incorrect operation. Heayberd chargers on view include mobile models providing charging rates of up to 40 A. The Runbaken de luxe battery booster (50 A) automatically tapers the charging rate.

New units for quick starting in cold weather are shown by the Autocar Electrical Equipment Co., Ltd. ("Kingsbury Surestart") and G.S.L. Products Ltd. ("Startall"). A new version of the Crypton "Thermo-safe" fast charger is now available without battery testing facilities. It will start an engine with a discharged battery within half a minute, and the engine will start on the battery alone in two minutes. Among other new Crypton products are a range of 1, 2 and 3 circuit garage chargers, a new high rate home charger and prototypes of a distributor tester and a generator and regulator

Black & Decker 6in standard bench grinder and (*right*) B. O. Morris high speed tungsten carbide cutter

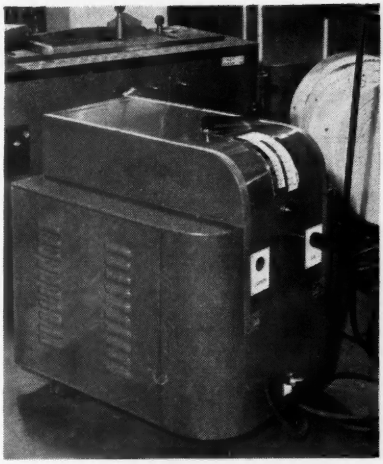


tester. A condenser tester and a test bench are further new Runbaken products.

Several welding plants have been developed with the requirements of the garage in mind. The "Power-in-Hand" unit shown by Thos. P. Headland, Ltd., though mobile and portable, can in a few moments be converted to a pedestal machine. The "Triangle" spot-gun welder operates at the rate of 1ft/min. Besides the "Leopard" portable spot welder, G. T. Riches & Co., Ltd., show another welder produced by the same manufacturers, Ring Motors, Ltd. This is a 200 A arc welder, which incorporates two chokes to give smoother operation and eliminate noise. The Bastian & Allen "Speedylectric" steam cleaner constructed to a new design can be seen on the same stand.

Among a profusion of electrically operated tools Black & Decker, Ltd., have a new 6in standard bench grinder, adjacent to which is a 31 year old valve refacer (still in use) alongside its modern counterpart. Demonstrations showing the capabilities of their various tools are being given by both Wolf Electric Tools, Ltd., and Desoutter Bros., Ltd. A high speed (20,000 and 30,000 r.p.m.) tungsten carbide cutter and a disc driving machine are new flexible shaft units displayed by B. O. Morris, Ltd., who also have a new small backstand linisher.

New compressed air and spray painting



"Leopard" 200 A arc welder

equipment includes the latest B.E.N. Patents "Pneuspray" portable general purpose unit and a British Pneumatic Tools tyre inflator. The Stenor "Weldmaster" has been developed for the easy handling and successful vulcanizing of all types of tyres. A 5 ton hydro-electric four post lift is a new Joseph Bradbury & Sons' product.

The exhibition is to close to-morrow (Saturday).

Materials Handling

IN a paper on this subject which Mr. L. Landon Goodman (E.D.A.) presented to members of the Institute of Materials Handling at the British Institute of Management in London on 24th October, the handling of materials was described as an integrating subject and an essential factor in primary production, manufacture and distribution. In manufacture it vitally affected the layout of the establishment, the design of the product and the processing.

The author considered that the main future development would be in refined methods of operating present types of equipment; for example, much could be achieved by using simple equipment with electronic instrumentation and control. But in some industries a very lengthy period of re-education would appear to be the only means of breaking down old practices to allow the introduction of new methods. The fact was often overlooked that good handling took the effort out of the work and therefore made it possible for older people to be employed in industry.

If production were to be increased, not only the larger firms but the smaller ones too would need to employ more up-to-date methods, for approximately half the total number of workers were in establishments having less than 500 employees. The author's main endeavour was to emphasize some of the very important effects of this new technology which, like truth, was a many-sided jewel. The most important fact of all, the author believed, was that materials handling was the only "tool" which would yield the important and substantial increase of productivity which was necessary in British industry to-day.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Morphy-Richards, Ltd.—The annual meeting will be held on 12th November. In his circulated statement, Mr. G. Wansbrough (chairman) says that the parent company's sales for last year were, in total, almost identical with those of the previous year, the fall of sales of toasters to the Canadian market being balanced by increased sales of electric irons and other products. The production of their new lightweight "Atlantic" iron began towards the end of the year under review and it is being well received in overseas markets. They expect that by the end of December the rate of production will approach 10,000 a week, and while export markets must have first claim, he hopes it will soon be available in limited quantities in the home market. They will shortly be producing also a travel iron, and with the increased manufacturing facilities provided by the new premises, they have other domestic electrical products in an advanced state of development which they expect to add to their range during the current financial year.

In spite of the reduction in sales to Canada, exports for the year under review were over 30 per cent of the total turnover. Since the end of the year the Canadian market has shown considerable improvement. The import restrictions in Australia are bound to limit sales in that market, and while there is likely to be some improvement in the next four months, the total volume of exports to Australia is not likely for some time to reach the record figures of 1951. Export sales to other markets, however, show surprising resilience.

In summarizing the financial results for the year to 30th June last in our issue of 10th October, we stated that the balance carried forward was £19,514 (against £51,208 brought in). These figures were incorrect, the balance carried forward being £90,904 (against £75,725 brought in).

Broadcast Relay Service, Ltd.—The list opened and closed on Friday last for an issue at par of £1,888,247 5½ per cent debenture stock, 1965-78. This is part of a financial operation by the company, the other being an offer of £1,000,000 ordinary 5s shares at 14s each, which is confined to a circle represented chiefly by ordinary stockholders. The net proceeds, estimated at £2,500,000, will be applied partly to the repayment of all but £250,000 of combined bank overdrafts amounting on 30th September last to £1.56 million. The balance will finance further development of the company's radio diffusion networks here and overseas.

The debenture stock issue was heavily oversubscribed.

Electric & Musical Industries, Ltd., reports a consolidated net profit of the company and subsidiaries in England and British overseas territories, after providing £764,500 for taxation, of £402,365 for the year to 30th June last, as compared with £663,000 in the preceding year. It is proposed to pay a dividend for the year of 12 per cent on the ordinary stock. In the previous year, there was an interim dividend of 8 per cent, followed by a final payment of 4 per cent. The 1,741,724 ordinary 10s shares issued last January rank for the 1951-52 dividend.

The Brush Electrical Engineering Co., Ltd., has announced an interim dividend on the ordinary shares of 4 per cent (unchanged). The directors state that although during the early months of 1952 the total profits earned by the manufacturing subsidiaries of the company in England were satisfactory, the company is now experiencing the trading difficulties confronting much of the engineering industry. Certain export markets for smaller products are temporarily closed, and accordingly a not inconsiderable reduction in the company's profits for the year 1952 is anticipated as compared with those earned in the year 1951. The group, however, has a substantial volume of orders on its books, and trading should be on a satisfactory level next year.

Aberdare Cables Africa, Ltd., reports a net profit for the year ended 30th June last of £182,962, as compared with £109,282 for the preceding year. It is proposed to pay a dividend for the year of 15 per cent (against 10 per cent). After making allocations totalling £110,000 to various reserves, the balance carried forward is £22,462 (against £11,832 brought in).

The Perak River Hydro-Electric Power Co., Ltd., reports a net profit for the year ended 31st July last of £514,616, as compared with £568,004 for 1950-51. It is proposed to pay the preference dividends for the eight years to 31st July, 1952, requiring £262,500.

W. H. Allen, Sons & Co., Ltd.—Arrangements have now been completed for the marketing of a block of shares, reference to which was made in our issue of 17th October.

The capital of the company was recently increased by a three-for-two scrip bonus to £1,021,875 in £1 shares, of which 256,402 are being made available for placing by the company's stockbrokers, Snell, Lovell & Co. It was expected that dealings would start yesterday (Thursday) around a price of 41s.

The Ever Ready Co. (Great Britain), Ltd., is paying an interim dividend of 15 per cent (unchanged).

Kerry's (Great Britain), Ltd., are paying an unchanged interim ordinary dividend of 5 per cent.

New Companies

C. W. Tucker (Salisbury), Ltd.—Registered 29th September. Capital £2,000. To acquire the business of a radio, electrical and television engineer and retailer carried on by C. W. Tucker at Salisbury, Wilts. Directors: C. W. Tucker and A. S. Hall. Regd. office: 400, Devizes Road, Salisbury, Wilts.

Chapelhall Cables, Ltd.—Registered in Edinburgh 30th September. Capital £100. Telegraph, telephone and general engineers and electric cable makers and contractors, etc. The first directors are not named. Solicitors: J. D. Langton & Passmore, 8, Holton Street, W.1.

Electrical Export Co., Ltd.—Registered 20th October. Capital £1,000. Manufacturers, exporters and importers of and dealers in electrical apparatus, appliances and fittings, radio and television apparatus and appliances, etc. Directors: L. Payne and A. J. Douglas. Regd. office: 13, Dunster Drive, Kingsbury, N.W.9.

Liquidations

H. E. Hawley (Stoke-on-Trent), Ltd., electrical contractors.—Winding up voluntarily. Liquidator, Mr. A. Wood, 12, Price Street, Burslem, Stoke-on-Trent, appointed 2nd October. Particulars of claims to the liquidator by 14th November. This notice is purely formal. All known creditors have been, or will be, paid in full.

Gordon Hughes Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. D. A. Owen, 21, The Parade, Leamington Spa, appointed 20th October.

At an extraordinary general meeting of the company on 20th October, Mr. Owen, the liquidator, was authorized to consent to the registration of a new company of the same name. The business is being carried on by the liquidator until the new company is incorporated.

S.I.M. Electrical Co., Ltd.—In voluntary liquidation. Meetings of creditors and members on 28th November at 10, Peacock Lane, Leicester, to receive an account of the winding-up by the liquidator, Mr. O. A. Watson.

Southcombe & Wilcocks, Ltd., electrical contractors.—Winding up voluntarily. Liquidator, Mr. S. J. Renouf, Commercial Union Chambers, 1, St. Andrew Street, Plymouth, appointed 15th October.

Bankruptcies

J. Dennis, 51, Ilbert Street, London, W.10, electrical contractor.—Receiving order made 17th October on a creditor's petition. First meeting 5th November and public examination 4th December, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

L. J. Quick, carrying on business at 2, The Mall, Ealing, W.5, electrical distributor.—Receiving order made 21st October on debtor's own petition.

H. L. Ruff, 141, Abbeydale Road, Sheffield, electrical engineer.—Receiving order dated 9th March, 1936, rescinded, order of adjudication dated 9th March, 1936, annulled, and petition filed 9th March, 1936, dismissed, debts having been paid in full.

H. M. Pollen, 22, Riverside Close, Staines, and 51, Thames Street, Staines, Middx, electrical engineer.—First meeting held 29th October. Public examination 10th December, at the Court House, St. Leonard's Road, Windsor, Berks.

S. E. Jones and **G. W. A. E. Short**, carrying on business under the style of S. E. Jones & Co., as dry battery manufacturers, at Elsecar, near Barnsley, Yorks.—Separate estate of S. E. Jones. Last day for receiving proofs for dividend 5th November. Trustee, Mr. J. B. G. Moore, 55, Queen Street, Sheffield, 1. Official Receiver.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 22nd November:—

ADVANCE. No. 704,657. Class 9. Electric signal generators, electrical testing and measuring apparatus, transformers and coils for high and low frequencies; and electric resistances and attenuators, all for use in radio and television apparatus and in radio and television testing apparatus.—Advance Components, Ltd., Advance Works, Back Road, Shernhall Street, Walthamstow, London, E.17.

TELYFLO. No. 709,422. Class 9. Apparatus for indicating, by means of electrical impulses transmitted over a telecommunication system, the flow of a metered commodity.—Measurement, Ltd., Terminal House, Grosvenor Gardens, London, S.W.1.

DIAMEX. No. 710,026, Class 9. Electric accumulators.—Diamex, Ltd., 1, Norfolk House, Laurence Pountney Hill, London, E.C.4.

No. 710,383 (design). Wireless and television apparatus and instruments, cinematographic apparatus and instruments, cinematograph films prepared for exhibition, teaching apparatus and instruments, gramophones and gramophone records.—H. M. Sutcliff, 155, Stockport Road, Ardwick, Manchester, 12.

STOCKS and SHARES

GOVERNMENT securities have provided the best feature of a rather patchy week in the Stock Exchange, the strong tendency of the £ sterling in foreign exchange markets being apparently the main support for the gilt-edged market. Most of the British Electricity stocks are about 10s per cent to the good. Industrials remained generally apathetic, with price changes few and far between. Among the quotable alterations was a rise of 1s 3d in Joseph Lucas shares, on which the dividend will be due within a week or two.

Electric Batteries

Shares of the principal electric battery manufacturers make up another group which is commonly the subject of a good deal of investment inquiry at about the time of the Motor Show, a group which includes a number of first-rate securities. The recent fall in the price of lead has also stimulated interest. Chloride Electrical Storage £1 ordinary shares are 2s 6d up at 3 1/16, giving a yield of no more that £4 18s per cent on the basis of the 15 per cent dividends paid for the last two years. Dividend policy has been consistently conservative, so that, despite the distribution of a 100 per cent share bonus three years ago, the financial reserves of the company are of impressive proportions. Ever Ready 5s shares, currently quoted at 26s 9d are another popular investment in this field, and pay about 6½ per cent on the money, the last dividend being 35 per cent. Oldham & Son's 1s shares stand at 2s 6d ex the recent 100 per cent capital bonus. Last year's 35 per cent payment would be equivalent to 17½ per cent on the present capital, so that the prospective yield is around 6 per cent. It remains to be seen whether the capital bonus heralds a more liberal dividend; the interim decision, due next month, may give a clue in that connection.

Brush Interim

In declaring the maintenance of the interim dividend for the current year at 4 per cent, the directors of Brush Electrical Engineering take the opportunity to give shareholders an account of progress to date. The company is now experiencing, says the statement, the trading difficulties confronting much of the engineering industry. Earnings this year are expected to show a reduction on the last figures. The group, however, has a substantial volume of orders on the books, and, in general, the circumstances justify repetition of the interim dividend at the same conservative rate as that paid for the last three years. On each of those occasions, the final has made a total of 10 per cent, the latest being paid from earnings equal to about 40 per cent on the ordinary capital. No further news is given about the group's need for new capital, which was discussed at the last annual meeting.

W. H. Allen

Particulars were published a week ago in connection with the quotation and marketing of part of W. H. Allen, Sons & Co.'s £1,022,000 ordinary share capital. Dealings in the £ shares are due to begin before the end of this week, an opening price of something over £ per share being expected. The prospectus describes the company's main activities to be connected with auxiliary shipbuilding machinery and with electric generating and pumping machinery. Earnings for the current year are expected, with the usual reservations, to come out at not less than £550,000, or £275,000 after taxation. From this the board would feel justified in paying an ordinary dividend of 15 per cent, costing £111,000 net. This rate has been paid for the last six years, but on smaller capital. An interim payment is intended for next January.

Broadcast Relay Issue

New 5s ordinary shares offered to existing shareholders of Broadcast Relay Service are changing hands at a premium of about 9s on the issue price of 14s, the old shares being quoted at 22s ex-rights. The second part of the company's finance programme, which is connected with a general extension of the rediffusion facilities at home and abroad, was completed a week ago, with a public issue of £1,888,000 5½ per cent debenture stock, redeemable 1965–78. Dealings in this stock were expected to start on Wednesday this week. A small premium was forecast over the issue price.

E.M.I. Dividend

Trading profits of the Electric & Musical Industries group for the twelve months ended last June are reported at about one-fifth below the previous year's, and the net figure, after tax, shows a larger reduction at £402,000, but the ordinary dividend is being maintained at 12 per cent. It applies this time to capital increased by the issue of 1,742,000 shares at 12s 6d early this year, so that the net amount to be distributed is some £50,000 more at £238,000. The 10s shares are quoted 3d lower at 15s 6d cum the dividend, allowing for which the yield is about 8 per cent.

Eight Years' Arrears

Perak Hydro-Electrics rose 1/16 to 15s on the directors' decision to pay the eight years' arrears of dividend on the company's 5 per cent preference shares. These amount to 8s gross. The preference stand at 22s. Expectation now looks for a possible dividend on the ordinary in about a year's time.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 27th Oct. 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	84	—	3	11	5
Brit. Elec. 1974/77	3	3	83	+½	3	12	3
Brit. Elec. 1976/79	3½	3½	89	+½	3	18	8
Brit. Elec. 1974/79	—	4½	100	+½	4	5	0
Calcutta Elec. ..	6†	6†	20/6	—	5	17	1†
East African Power	7	7	24/-	−6d	5	16	9
Nigerian Elec. ..	10	10	21/3	—		—	
Palestine Elec. "A"	5†	Nil	12/6	—		—	
Perak Hydro-Elec.	Nil	Nil	15/-	+1/16		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	20	13/6	—	7	8	3
Aerialite (1/-) ..	83½	88½	8/3	—	10	14	2
Aron Elec. Ord. ..	15	15	33/9	—	8	17	9
Assoc. Elec. Ord...	20	20	72/6	—	5	10	6
Automatic Tel. & El.	15	15	56/3	—	5	6	8
Babcock & Wilcox	18	18	72/-	—	5	0	0
Baldwin, H. J. (2/-)	25	25	4/-	—	12	2	6
Bakelite (10/-) ..	—	—	17/6	—		—	
British Aluminium	10	12	44/-	+3d	5	9	1
B.I. Callender's ..	7½	9	32/6	—	5	10	9
British Thermostat (5/-)	30	30	27/-	—	5	11	1
British Vac. Cleaner (5/-)	25	25	13/-	—	9	12	4
Brook Motors (10/-)	20	20	28/9	—	6	19	2
Brush Ord. (5/-) ..	10	10	5/-	—	10	0	0
A. F. Bulgin (1/-) ..	27½	30	2/6	—	12	0	0
Burco (5/-) ..	42½	38¾	21/3	—	9	2	3
Chloride El. Storage	15	15	61/3	+⅛	4	18	0
Cole, E. K. (5/-) ..	25	25*	15/9	—	7	18	9
Cossor, A. C. (5/-)	Nil	10	8/6	—	5	17	8
Crabtree (10/-) ..	17½	17½	54/-	—	5	3	0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9/-	—	6	5	0
De La Rue (5/-) ..	50	35*	10/-	—		—	
Decca (1/-) ..	112½	112½	17/6d	−6d	6	8	6
Dewhurst (2/-) ..	35	22½*	4/6	—		—	
Dictograph Tel. (2/-)	20	20	4/9	—	8	8	6
E.M.I. (10/-) ..	8	12	15/6	−3d	7	14	10
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	50/-	—	6	0	0
Enfield Cable Ord.	7½	7½	23/9	—	6	6	4
English Electric ..	15	15	55/6	—	5	8	1
Ericsson Tel. (5/-)	22†	22*†	40/-	—	2	12	6†
Ever Ready (5/-)..	35	35	26/9d	+3d	6	10	9
Falk Stadelmann	15	15	38/-	—	7	17	10
G.E.C. Ord. ..	17½	22½	40/6	—	5	11	1*
General Cables (5/-)	30	30	14/6	—	10	6	10
Greenwood & Batley	15	15	37/-	—	8	2	2
Hackbridge Cable (5/-)	20	20	11/3	—	8	17	10
Hackbridge Hewittic (5/-) ..	18	20	16/3	—	6	3	0
Hall Tel. Acc. (10/-)	10	10	10/6	—	9	10	6
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (5/-) ..	20	20	17/9	—	5	12	8
Holophane (5/-) ..	15	20*	11/3	—	8	17	10
Hoover (5/-) ..	37½	35*	22/6d	−1/6d	7	15	6

Company	Dividend Previous	Dividend Last	Middle Price 27th Oct. 1952	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	23/-	−1/-	5	8	8
Johnson & Phillips	15	15	53/3	—	5	12	9
Lancashire Dynamo	22½	12½*	42/6	—	5	17	8
Laurence, Scott (5/-)	12½	15	12/9	—	5	17	8
London Elec. Wire	10	12½	48/9	+6d	5	2	6
J. Lucas	17½	7½*	35/-	+1/16	4	5	9
Marryat & S. (2/-)	22½	22½	5/-	—	9	0	0
Mather & Platt ..	12½	12½	42/6	—	5	17	8
Metal Industries ..	10	15	40/-	+6d		—	
Mid. Elec. Mfg. ..	15	15	53/9	—	5	11	6
Murex	12½	15	53/6	—	5	12	3
Newman Ind. (2/-)	6	10	2/3	—	8	17	10
Oldham & Son (1/-)	30	35	2/6d	−6d		—	
Parnall (Yate) (5/-)	6	6	4/3d	−3d	7	1	3
Parsons, C. A. ..	15	10*	53/9	—		—	
Plessey (5/-)	20	22½	19/9	—	5	14	0
Pye Deferred (5/-)	18	18	15/3	—	5	18	0
Revo (10/-) ..	27½	27½	40/-	—	6	17	6
Reyrolle	15	10*	47/6	—		—	
Scot. Cable (1/-) ..	30	32	11/3	—		—	
Siemens Ord. ..	10	10	34/-	+6d	5	17	8
Strand Elec. (5/-)..	17½	17½	8/9	—	10	0	0
Sturtevant (5/-) ..	16½†	17½*†	25/-	—		—	
Switchgear & Cowans (5/-)	22½	22½	14/6	—	7	15	2
Taylor T. (5/-) ..	20	20	20/-	—	5	0	0
T.C.C. (10/-) ..	20	20*	37/6	—		—	
T.C. & M.	10	10	26/-	—		—	
Telephone Mfg. (5/-)	10	10	8/-	—		—	
Thorn Elec. (5/-)..	10	12½	8/6	—	7	7	0
Tube Investments	25	25	55/9	—		—	
Vactric (5/-) ..	Nil	Nil	3/9	—		Nil	
Veritys (5/-) ..	Nil	7½	4/9	—	7	18	0
Walsall Conduits (4/-)	70	70	45/-	—		—	
Ward & Goldstone (5/-)	45	45*	32/6	—		—	
Watford (2/-) ..	25	25	6/3	—	8	0	0
Westinghouse Brake	14	14	49/3	—	5	13	9
West, Allen (5/-)..	12½	15	10/3	—	7	6	4
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	4½	4½	86½	—	5	4	0
Ord.	56/3	57/6	55	—		—	
Anglo-Portuguese	8	8	20/9	+3d	7	14	3
Brit. Elec. Traction: Def. Ord. ..	22½	25	455	+5	5	10	0
Cable & Wireless: Ord.	6	8	124	—	6	9	1
4% Loan ..	4	4	97	—	4	2	6
Calcutta Trams ..	6†	6†	22/-	−6d	5	9	1†
Cape Elec. Trams	4	5	12/-	—	8	6	8
Marconi Marine ..	7½	10	31/-	+6d	6	9	0
Oriental Tel. Ord.	16	16	56/3	—		—	
Telephone Props...	8	8	32/6	—	4	18	6
Tele. Rentals (5/-)	10	10	8/9	—	5	14	3

* After capital bonus.
† Dividends are paid free of Income Tax.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Adjustable Lamp

THE "Klamplight" adjustable lamp offered by BATTENBERG & CO., LTD., 6, Great Winchester Street, London Wall, E.C.2, is of modern design incorporating three vertical joints and a horizontal swivel joint. A light clamp faced with felt permits the lamp to be placed on delicate or polished surfaces without leaving a mark. The standard model with a light polished beech stand and green moulded shade costs 17s 6d. With a grey cellulosed aluminium shade the price is 22s 6d and with the stand also cellulosed 27s 9d. A larger model of heavier construction and a 6in longer reach costs 29s.

Lifting Magnet

"Magna-Lift" electrically operated lifting magnets are made in diameters ranging from 8in to 18in by RAPID MAGNETIC MACHINES, LTD., Lombard Street, Birmingham, 12. They can be wound to suit any d.c. voltage up to 250 V, the current consumption being about 3 A. These magnets are capable of dealing with most shapes and sizes of steel weighing up to about 2 tons.

13 A Plugs and Sockets

Three-pin 13 A fused plugs and shuttered socket outlets for flush and surface mounting are now being made in brown or ivory white moulded material by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Birmingham, 11. Replacement fuses are also available together with steel and wood boxes to accommodate the flush mounting models.

Strip Bell Push

Many applications will no doubt be found for the "Cronapress" strip bell push which is made in lengths up to 5ft by the CRONAPRESS CO., Rossendale, Lancs. Essentially it consists of an aluminium base to which is attached an insulated rigid copper rail forming a fixed contact as shown in the accompanying diagram. The moving contact is attached to the rubber strip which is available in any length so that successive sections of base can be joined together to give any desired length of bell push. Fixing screws are concealed by the rubber strip and there is adequate space for internal wiring should this be necessary. Overall size of "Cronapress," which is not suitable for mains voltage operation, is 1⅜in by ⅝in. The aluminium base is available either plain or anodized in various colours.

Electric Clothes Boiler

The "Apex" electric galvanized clothes boiler recently introduced by LAMB, HINGLEY & CO., LTD., Stour Works, Lye, Stourbridge, Worcestershire, has a capacity of 4 gall and is fitted with tubular heat-resisting handles. A perforated shield protects the 2 kW element from contact with the clothes and also serves the purpose of maintaining circulation of the water. Suitable for use on 200–250 V, the boiler is provided with 6ft of 3-core rubber covered cable and the overall height is 12½in. The retail price is about 75s.

Domestic Dish Washer

The "Dishmaster" dish washing machine recently introduced to this country by DISHMASTER (LONDON), LTD., 151, Great Portland Street, London, W.1, differs from the normal dish washer in that the dishes remain static while the water circulates around them. The machine can accommodate up to 54 pieces of crockery, plus cutlery. It is claimed that the whole operation, washing, rinsing and drying, takes only 3½ minutes. Hot water is obtained from the normal house supply to which the machine should be connected. The "Dishmaster" measures 24in by 24in by 35¾in high and is operated by a ½ h.p. a.c. motor. It retails at £99 10s 0d (plus £44 purchase tax in the United Kingdom).

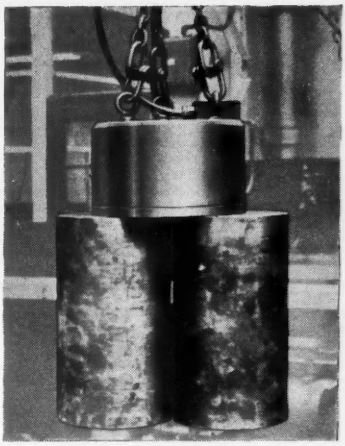
Waste Disposal Unit

Also marketed by the same company is the "Wastemaster" waste food disposal unit. This can be fitted underneath any steel or plastic sink and the outlet is plumbed to the existing waste pipe. All kitchen scraps, including newspaper and even broken glass, can then be swept straight down the sink drain and the cold water tap allowed to run. The unit when switched on then sets in motion a series of metal blades which shreds and pulverizes the waste and passes it down the drain into the sewer.

The "Wastemaster," which is fitted with a ½ h.p. a.c. motor, is priced at £54 (plus £24 purchase tax in this country).

Opposite page:— **(1) "Klamplight" adjustable lamp. (2) "Magna-Lift" electromagnet. (3) M.E.M. three-pin 13 A plugs and shuttered socket outlets. (4) "Cronapress" strip bell push. (5) "Dishmaster" washing-up machine. (6) "Apex" electric clothes boiler**

(1)



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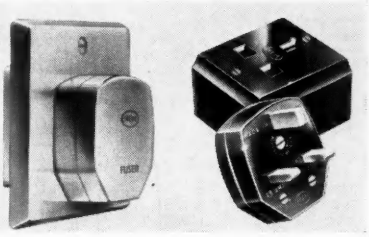

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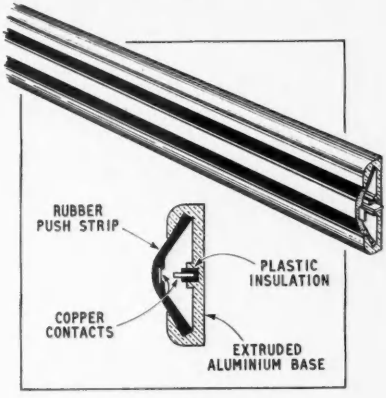
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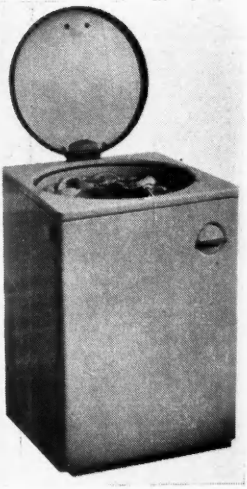

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NEXT WEEK'S EVENTS

Monday, 3rd November

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "275-kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "A Logical Approach to the Problems of Electric Space-Warming," by D. H. Parry.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North-East London Branch. "Motor Repairs," by D. R. Reekie.

IPSWICH.—Crown and Anchor Hotel, 6.30 p.m. I.E.E. District Meeting. "The Determination of Time and Frequency," by H. M. Smith.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Television," by H. B. Reeder.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Domestic Electrical Installations: Some Safety Aspects," by H. W. Swann.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "Lightning," by J. H. Gridley.

At the Geological Society, Burlington House, 5.30 p.m. Society of Engineers. "Strain Measurements by Electronic Methods," by S. F. Smith.

MAIDSTONE.—"Wig and Gown," 7.30 p.m. I.E.E. District Meeting. "Electronics in the Balancing of Gas Turbine Engines," by S. F. Bettinson.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "The General Principles of Digital Computors and their Applications," by Prof. F. C. Williams.

Monday, 3rd November—Saturday, 8th November

LONDON.—Olympia. Public Works and Municipal Services Congress and Exhibition.

Tuesday, 4th November

BRISTOL.—Grand Hotel, Broad Street, 7.30 p.m. Institution of Engineering Inspection, South Western Branch. "Heat Treatment," by R. F. Coppola.

COVENTRY.—Technical College, 7.30 p.m. Institution of Engineering Inspection, Coventry Branch. "Precision Mechanisms," by A. Hardman.

ELTHAM.—Congregational Church Hall, Court Road, 8 p.m. A.S.E.E. South East London Branch. "Electric Arc Welding."

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "The Use of Electricity in the Gas Industry," by O. H. Baker.

HULL.—Y.E.B., Ferensway, 7.15 p.m. I.E.E. North Midland Centre. District Meeting. Chairman's Address by H. S. Moody.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Circuit Applications of Cold-Cathode Trigger Tubes," opened by K. Kandiah.

LOUGHBOROUGH.—Loughborough College, 6.30 p.m. I.E.E. East Midland Centre. "Inhibited Transformer Oil," by W. R. Stoker and C. N. Thompson. "Stability of Oil in Transformers," by P. W. L. Gossling and L. H. Welch.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. Institution of Electrical Engineers, North-Western Centre. "The Economic Basis of Battery-Electric Road-Vehicle Operation and Manufacture," by H. W. Heyman.

NEWCASTLE-ON-TYNE.—At the Institute of Mining and Mechanical Engineers, Neville Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, North East Coast Branch. "District Heating in France," by E. A. Pearce.

NOTTINGHAM.—E.M.E.B., Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Modern Developments of Variable Speed Electric Drives," by J. V. Woods.

SHEFFIELD.—Victoria Hotel, 7 p.m. Incorporated Plant Engineers, South Yorkshire Branch. Annual dinner.

STOKE-ON-TRENT.—M.E.B., 31, Kingsway, 6 p.m. I.E.S. Stoke-on-Trent Group. "Planning an Industrial Lighting Scheme," by V. A. Heydon.

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "Economic Plant Sizes and Boiler-Set Groupings on the British Grid," by B. Donkin and P. H. Margeo. (Meeting postponed from 28th October.)

Wednesday, 5th November

EDINBURGH.—357, High Street, 7 p.m. I.E.S. Edinburgh Centre. "On Planning Lighting Installations," by J. F. Roper.

LEICESTER.—Leicester College, 7 p.m. Institution of Works Managers, Leicester Branch. "A Review of Human Relations Trends," by J. Marsh.

LONDON.—At the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, London Section. "The Specification and Design of Standardized Units for Electronic Computers," by A. D. Booth.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. Institution of Heating and Ventilating Engineers. "Whitehall Gardens and the Whitehall District Scheme," by T. R. Keeley.

MANCHESTER.—Engineers' Club, Albert Square. North Western Fuel Luncheon Club. Luncheon. "Incentives for the Prevention of Industrial Air Pollution," by W. L. Mather.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Electricity in Farm Crop Drying," by C. A. Cameron Brown and P. G. Finn-Kelcey.

NEWCASTLE-ON-TYNE.—Minor Durrant Hall, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "The Architect's Approach to Artificial Lighting," by R. G. Cox.

NOTTINGHAM.—College of Arts and Crafts, Waverley Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, East Midlands Branch. "The Thermal Behaviour of a Building," by A. C. Pallot.

SOUTHAMPTON. Polygon Hotel, 6.30 p.m. I.E.E. Southern Centre. "Equipment of Battery-Electric Vehicles," by W. D. Sheers. "The Economic Basis of Battery-Electric Road-Vehicles Operation and Manufacture," by H. W. Heyman.

WOOD GREEN.—Three Jolly Butchers Hotel, 8.15 p.m. A.S.E.E. North London Branch. "Tape Recorders," by W. H. Y. Grainger.

Thursday, 6th November

BIRMINGHAM.—I.E.S. Birmingham Centre. Ladies' night.

BRADFORD.—Y.E.B., 45–53, Sunbridge Road, 7.30 p.m. I.E.S. Bradford Group. "Glass and its Manufacture," by F. Mathers.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "Radar Aids to Marine Navigation," by Group Capt. E. Fennessey.

GLASGOW.—At the Engineering Centre, Sauchiehall Street, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The Development of the Radio and Electronics Industry in India," by G. D. Clifford.

39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. "The Lighting of Shipyards," by J. S. McCulloch.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "Telemetering for System Operation," by R. H. Dunn and C. H. Chambers.

NOTTINGHAM.—E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "The Effect of Light on the Growth and Development of Plants," by Miss D. Vince.

(Continued at foot of page 979)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 10th December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

6956. Cossor, Ltd., A. C., Bedford, L. H., and Jolch, L.—Radio systems for the navigation of flying bodies. 6th April, 1945. (684229.)

1947

17713. Sperry Gyroscope Co., Inc.—Tuning of resonant circuits for high-frequency generators. 4th July, 1947. (683941.)

23286. Bataille, R.—Apparatus for transmitting and receiving radio oscillations. 22nd August, 1947. (683942.)

1948

6098. Dehn, S. G. (Sunbeam Corporation).—Electric dry shavers. 27th February, 1948. (684151.)

11415. Air Preheater Corporation.—Electrostatic precipitators. 26th April, 1948. (684024.)

12111. Compagnie Industrielle des Téléphones.—Automatic telephone or telegraph systems. 3rd May, 1948. (683881.)

19967. Williams, F. C., and Kilburn, T.—Electronic circuits for digital computing systems. 14th July, 1949. (683882.)

30149. Meopta, and Krecan, J.—Electric drive for the operation of devices such as valves and the like. 19th November, 1948. (683944.)

1949

12251. Thorn Electrical Industries, Ltd.—Luminescent calcium halophosphate phosphors. 7th May, 1949. Cognate application 12252, 22nd April, 1949. (684025.)

12453. British Thomson-Houston Co., Ltd., and Read, J. C.—Operation of multi-phase mercury and convertor installations. 9th August, 1950. (684026.)

12871. National Research Development Corporation.—Means for controlling the speed of direct current electric motors. 14th August, 1950. (684095.)

15470. Pye, Ltd., and Court, P. R. J.—Circuit arrangement for controlling the frequency of a television line time base oscillator. 12th June, 1950. (683947.)

16014. Ferranti, Ltd., and McCallum, D. M.—Servo systems. 11th September, 1950. (683889.)

19877. British Thomson-Houston Co., Ltd., Ludbrook, L. C., and Maggs, A. H.—Electric motor control systems. 28th July, 1949. (683951.)

21390. Belling & Co., Ltd., and Brunton, D. M. M.—Electric cooking ovens. 10th July, 1950. (684158.)

23518. Automatic Electric Laboratories, Inc.—Automatic telephone exchange systems. 12th September, 1949. (683893.)

24790. British Thomson-Houston Co., Ltd.—High-frequency generators. 27th September, 1949. (683894.)

27452. Ferranti, Ltd., Stewart, J., and Allen, C.—Indicating instruments. 10th January, 1951. (684029.)

28530. Ferranti, Ltd.—Graphical recording systems. 2nd February, 1951. (683899.)

32380. Siemens Electric Lamps & Supplies, Ltd., and Cumming, H. W. L.—Electrode and current leading-in structures of electric lamps and kindred devices. 18th December, 1950. (684031.)

1950

782. Usag Ultraschall-Ges.—Supersonic wave piezo-electric crystal oscillators or vibrators. 11th January, 1950. (684165.)

837. Du Mont Laboratories, Inc., A. B.—Generation of a sine wave by electric circuits. 12th January, 1950. (683902.)

1258. Compagnie Générale de Télégraphie sans Fil.—Electric tuning of the natural frequency of a cavity resonator. 17th January, 1950. (684033.)

1372. British Broadcasting Corporation, and Paris, G. H.—Mountings for pick-up tubes in television cameras. 16th January, 1951. (684034.)

4777. English Electric Co., Ltd.—Flexible tubes and methods of making same. 14th February, 1951. (683966.)

9863. Western Electric Co., Inc.—Station identification circuits for telephone systems. 21st April, 1950. (683911.)

10226. Electric & Musical Industries, Ltd.—Tuning mechanism of radio apparatus. 26th April, 1951. (684041.)

12790. General Electric Co., Ltd., and Still, J. E.—Methods of and apparatus for measuring the saturation temperature of solutions. 22nd May, 1951. (684042.)

12791. General Electric Co., Ltd., and Cowell, E. W.—Methods of boring holes in crystals or pieces of crystalline material. 10th May, 1951. (683971.)

12917. Steatite Research Corporation.—Ceramic parts for electrical devices having magnetic properties. 23rd May, 1950. (684043.)

12951. Electric & Musical Industries, Ltd.—Television transmitting apparatus. 24th May, 1951. (684175.)

15108. Standard Telephones & Cables, Ltd.—Circuit for the comparison of potentials of two d.c. sources. 16th June, 1950. (683919.)

15474/5. Nettle Accessories, Ltd., and Goodliffe, J. G.—Electric plug and socket connectors. 26th June, 1951. (6841090.)

16390. English Electric Co., Ltd.—Electrical rectifier circuits. 1st October, 1951. (684180.)

16922. British Thomson-Houston Co., Ltd.—Emergency release mechanism for power-driven wringers. 6th July, 1950. (684049.)

17312. Compagnie Générale de Télégraphie sans Fil.—Magnetron arrangement. 11th July, 1950. (684050.)

NEXT WEEK'S EVENTS—*continued*

Friday, 7th November

BIRMINGHAM.—College of Technology, 7 p.m. I.E.E. South Midland Education Discussion Circle. Joint meeting with the South Midland Radio Group. "The Teaching of Television Servicing," by R. G. Moseley.

BRISTOL.—S.W.E.B., Colston Avenue, 6.15 p.m. I.E.S. Bath and Bristol Centre. Brains trust in conjunction with members of the E.A.W.

EDINBURGH.—George Hotel, George Street, E.I.B.A. Edinburgh Branch. Dinner-dance.

HUDDERSFIELD.—Electricity Showroom, Market Street, 7.15 p.m. I.E.S. Huddersfield Group. "Modern Aerodrome Lighting," by J. W. Morse.

LONDON.—Savoy Hotel, W.C.2, 6.45 for 7.15 p.m. Association of Electrical Machinery Trades. Annual dinner and ball.

Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "Water Turbine Governors," by N. G. Dennis.

St. Ermin's Hotel, S.W.1, 6.30 for 7 p.m. Institution of Works Managers, London Branch. Dinner and annual general meeting.

MANCHESTER.—Apollo Cinema Restaurant, Ardwick Green, 6.30 for 7 p.m. I.E.E. North-Western Utilization Group. Dinner and dance.

WEST HARTLEPOOL.—Grand Hotel. E.I.B.A. Tees-side Branch. Dinner-dance.

24146. British Insulated Callender's Cables, Ltd.—Method for applying distinctive marking to insulated electric conductors. 2nd October, 1951. (684196.)

24739. Reyrolle & Co., Ltd., A.—Fault-responsive networks for electric circuits. 27th September, 1951. (683989.)

25031. Eberbach & Son Co., Inc.—Liquid-cathode electrolysis cell. 13th October, 1950. (684118.)

25532. Radio Corporation of America.—Colour television apparatus including an arrangement for eliminating adjacent channel interference. 19th October, 1950. (683926.)

26451. Naamlooze Vennootschap Electromotorenfabriek Dordt.—Devices for adjusting the electrical driving mechanism of a textile spinning machine. 30th October, 1950. (684121.)

26681. Igranic Electric Co., Ltd.—Electrical contacts. 1st November, 1950. (684199.)

27093. Belling & Lee, Ltd.—Aerials. 1st October, 1951. (684200.)

28328. General Electric Co., Ltd., James, E. G., and Lindell, A. O. E.—Manufacture of crystal contact devices. 24th September, 1951. Addition to 666916. (684123.)

29086. British Thomson-Houston Co., Ltd.—Vacuum cleaners. 28th November, 1950. (683994.)

31486. Philips Electrical Industries, Ltd.—Circuits for testing outlets in automatic selector switches. 28th December, 1950. (683995.)

1951

32. National Cash Register Co.—Impulse-responsive electronic accumulators. 1st January, 1951. (684206.)

425. British Thomson-Houston Co., Ltd.—Stationary electrical induction apparatus. 5th January, 1951. (684001.)

1306. Mullard Radio Valve Co., Ltd.—Frequency changers for radio receivers. 17th January, 1951. (684058.)

1497. Radio Corporation of America.—Electron emission material. 19th January, 1951. (684059.)

2550. Aktiebolaget Svenska Flaktfabriken.—Electrostatic filters. 1st February, 1951. (684060.)

2553. Poor & Co.—Method of electroplating. 1st February, 1951. (684132.)

4908. Soc. Nationale de Constructions Aeronautiques du Sud-Est.—Rotary electrical current collector for measuring instruments, particularly strain gauges. 28th February, 1951. (684135.)

4986. Babcock & Wilcox, Ltd.—Tubulous vapour generating, superheating and reheating units. 1st March, 1951. (684136.)

5276. Pierce Foundation, J. B.—Thermostatic and circuit breaker devices. 5th March, 1951. (684137.)

5662. General Motors Corporation.—Snap-action electrical switch control mechanisms. 8th March, 1951. (684138.)

5792. Oosterling, J., and Bootsman, G.—Electric plug sockets. 9th March, 1951. (684014.)

6273. Soc. Savoisienne de Constructions Electriques.—Safety devices for oil immersed electrical apparatus such as transformers. 15th March, 1951. Addition to 660181. (684140.)

7296. Albrecht Jung Ges.—Electrical contacts. 29th March, 1951. (684143.)

7449. Radio Corporation of America.—Colour television transmitter. 30th March, 1951. (684214.)

7919. British Thomson-Houston Co., Ltd.—Wet pick-up suction cleaners. 5th April, 1951. (683749.)

8298. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 10th April, 1951. (684144.)

8956. British Thomson-Houston Co., Ltd.—Suction cleaners. 17th April, 1951. (683672.)

9248. Biesta, D. J. H., and Schmidt, W.—Electric conduit systems in buildings. 20th April, 1951. (684146.)

11143. Philips Electrical Industries, Ltd.—Devices for proportional electric control. 11th May, 1951. (683590.)

11258. Fairweather, W. C. (Singer Manufacturing Co.).—Electric clutch-brake motor. 15th May, 1951. (683798.)

11666. Philips Electrical Industries, Ltd.—Frequency and phase stabilizing circuit arrangements. 18th May, 1951. (684217.)

12384. Tucker & Co., Ltd., J. H.—Electric lampholders incorporating switches of the pushbar type. 26th May, 1951. (684219.)

12915. Standard Telephones & Cables, Ltd. (Lorenz Akt.-Ges. G.).—Mixing arrangement for centimetric waves. 31st May, 1951. (683755.)

13283. Mullard Radio Valve Co., Ltd.—Two-part electrical connectors. 5th June, 1951. (684019.)

13656. Standard Telephones & Cables, Ltd. (Federal Telephone & Radio Corporation).—Microwave frequency stabilizer. 8th June, 1951. (684073.)

14111. Philips Electrical Industries, Ltd.—Methods of manufacturing magnetically anisotropic permanent magnets. 14th June, 1951. (683758.)

14875. Rauland Corporation.—Cathode-ray tubes. 22nd June, 1951. (683596.)

14876 & 8. Rauland Corporation.—Cathode-ray image reproducing devices. 22nd June, 1951. (683597 & 8.)

17854. Standard Telephones & Cables, Ltd.—Combined television receiver and loudspeaker. 27th July, 1951. (683877.)

19248. Reyrolle & Co., Ltd., A., Young, A. F. B., and Ellis, N. S.—Electric current transforming devices. 8th June, 1949. (683599.)

19483. Soc. Francaise d'Equipements pour la Navigation Aerienne S. F. E. N. A.—Electrical remote control and indicating systems. 17th August, 1951. (683680.)

20427. Titan Co., Inc.—Manufacture of storage batteries. 29th August, 1951. (683759.)

21677. Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz.—Devices for improving the error curves of induction meters having a number of driving parts. 14th September, 1951. (683879.)

1952

9960. British Thomson-Houston Co., Ltd., Ludbrook, L. C., and Maggs, A. H.—Electric control circuits embodying saturable reactors. 28th July, 1949. Divided out of 683951. (684020.)

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—14th January. State Electricity Commission of Queensland. Supply of 11 kV metalclad, oil immersed fuse gear for Townsville Regional Electricity Board. (C.R.E. 35647/52. Ten/4963.)*

SYDNEY.—24th February. Snowy Mountains Hydro-Electric Authority. Four 80 MW vertical shaft water wheel driven generators and four 110,500 b.h.p. vertical shaft Francis reaction type water turbines. (C.R.E. 35158/52. Ten/4949.)*

Birmingham.—10th November. City Welfare Committee. Additions and alterations to the electrical installations at Highbury Hall. City engineer, Civic Centre.

Bridgwater.—11th November. Town Council. Motor, switchgear and cables at Ashford pumping station. Borough engineer, Town Hall.

Grantham.—10th November. Town Council. Equipment for lighting pedestrian crossing beacons. Town clerk, Guildhall.

Ilford.—18th November. Corporation. Lighting of pedestrian crossings. (See this issue.)

India.—DELHI.—26th December. Director of Supplies and Disposals. Ceiling and table fans. (C.R.E. 35128/52. Ten/4970.)* 31st December. House service meters. (C.R.E. 35026/52. Ten/4944.)*

London.—WANDSWORTH.—12th November. Borough Council. Supply of 205 sets of equipment for lighting of pedestrian crossing beacons. (See this issue.)

Luton.—11th November. Corporation. Street lighting equipment. (See this issue.)

Pakistan.—LAHORE.—11th November. Department of Supply and Development. Switchgear for a.c. substations at Kohat and Risalpur. (C.R.E. 35026/52. Ten/4944.)*

KARACHI.—23rd November. Department of Supply and Development. Air conditioning and humidification plants, including electric motors and fittings for textile mills. (C.R.E. 36037/52. Ten/4979.)*

South Africa.—JOHANNESBURG.—4th December. South African Railways Stores Department. Portable electrically driven d.c. welding machines. (C.R.E. 35772/52. Ten/4978.)*

Sunderland.—10th November. Corporation. Lighting equipment for pedestrian crossing beacons. (See this issue.)

Uruguay.—MONTEVIDEO.—4th November. Usinas Electricas y Telefonos del Estado. Telephone spares. (C.R.E. 34751/52. Ten/4943.)*

Wanstead and Woodford.—19th November. Corporation. Lighting of pedestrian crossings. (See this issue.)

West Hartlepool.—3rd November. Corporation. Electrical installations in 216 flats on the Owton Manor estate. Borough architect, Municipal Buildings.

ORDERS PLACED

Barrow-in-Furness.—Corporation. Electrical installation at St. Aloysius' Roman Catholic Secondary School (£5,822).—R. Hadwin & Son.

Bedford.—Highways and Sewerage Committee. Recommended. Supply and erection of 31 reinforced concrete street lighting columns and brackets for extending the fluorescent lighting in Ampthill Road (£2,471).—Metropolitan-Vickers Electrical Co., Ltd.

Derby.—Sheffield Regional Hospital Board. Recommended. Electrical installation at additional accommodation, Etwall Rehabilitation Centre, Derby (£3,100).—Barnett & Soans, Ltd.

Folkestone.—Corporation. Recommended. Wiring of 44 houses, Creteway Down estate (£1,755).—South Eastern Electricity Board.

Haverfordwest.—Corporation. Recommended. Installation of electric light and power in about 143 Council houses under Scheme No. 2 (£2,189).—R. G. Davies.

Sheffield.—Regional Hospital Board. Recommended. Installation of lifts in wards 10, 11 and 12, at the City General Hospital, Sheffield (£2,660).—Evans Lifts, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bathavon.—Houses (210), on sites at Batheaston, Compton Dando, Corston, Freshford and Shoscombe; C. C. Axford, R.D.C. surveyor, Westgate Buildings, Bath.

Beckenham.—School, Cavendish Way; Kent county architect, Springfield, Maidstone.

Birmingham.—Extensions, Aston Road, for Chas. Wade & Co., Ltd.; Ewen Harper & Co., architects, 191, Corporation Street, Birmingham.

Brierley Hill.—Apprentices' training school for Richard Thomas & Baldwins, Ltd.; Webb & Gray, architects, St. James Road, Dudley.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Blackpool.—Flats and houses at Toronto Avenue, Moor Park Avenue, Dingle Avenue, Rodwell Walk and Mereside; borough surveyor.

Bristol.—Works, Brislington Trading estate; Burton, Son & Sanders, St. Paul Street, Portland Square.

Cardiff.—Additional works; Loveridge, Ltd., 151/3, Bute Road.

Chester.—New workshops (£23,000), Sealand Road, for Chester and District Blind Welfare Society; Miss B. H. Killip, secretary.

Chesterfield.—Block of flats, Newbold estate (£16,000); borough architect.

Cleethorpes.—Blocks of 3-storey flats, Beacon Hill; borough architect.

Colchester.—Ten-vehicle ambulance station for Essex C.C.; county architect, County Hall, Chelmsford.

Houses (210), Monkwick scheme; J. S. Orchard, borough surveyor, West Stockwell Street.

Consett.—New factory for Light Fabrications, Ltd., Consett.

Corby.—Block of shops and flats, Market Square; Gee, Walker & Slater, Ltd., builders, Uttoxeter Old Road, Derby.

Houses (342), Lodge Park estate, for U.D.C.; Sherriff & Co. (1943), Ltd., Barkby Road, Leicester.

Dorset.—Schools at Blandford (£136,000), Bridport (£110,000) and Dorchester (£54,910); county architect, County Hall, Dorchester.

Durham.—Ambulance station at Fishburn, ambulance headquarters at Framwellgate Moor and additions to Stanley ambulance station; county architect, Court Lane, Durham.

X-ray department at Dryburn Hospital; Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne.

Eastbourne.—Flats (39), Compton Place; H. H. Ford, architect, 24a, Cornfield Road.

Edinburgh.—Extension at Princess Margaret Rose Hospital (lighting, power, bell, fire alarm, etc.); John Kinnaird, secretary Board of Management for Edinburgh Central Hospitals, 1, Rillbank Terrace, Edinburgh, 9.

Felling (Co. Durham).—Machine shop, 76ft long, for R. B. Harrison & Co., Ltd.; R. T. James & Partners, engineers, 1, St. Nicholas Buildings, Newcastle-on-Tyne.

Finchley.—Extensions to bakery; Merry Miller Bakeries, Ltd., Park Road, N.2.

Gateshead.—Alterations to Fountain View old people's home (£15,000); H. J. Cook, Corporation's chief architect.

Hove.—Additional depot buildings; Shell-Mex & B.P., Ltd., Shell Mex House, Strand, W.C.2.

Flats (110) and houses (20), Hangleton Park estate; borough engineer.

Latimer (Bucks).—Officers' houses; Harry Neal, Ltd., builders, 117, Baker Street, W.1.

Leicester.—X-ray and pathological department at General Hospital; R. H. Taylor, Jarram Street, Leicester.

Lincoln.—Development of County Hospital; Watkins, Coombes & Partners, architects, 191, High Street, Lincoln.

London.—Hammersmith.—Flats (28), Flora Gardens; borough engineer.

Paddington.—Operating theatre at Harrow Road Hospital; North West Metropolitan Regional Hospital Board, 11, Portland Place, W.1.

Lowestoft.—Ice works, Hamilton Road; East Anglian Ice & Cold Storage Co., Ltd., Battery Green Road.

Luton.—Flats (48), on Farley Hill estate; W. H. Robinson, town clerk.

Manchester.—Office building; Skipworth, Jones & Lomax, Ltd., Trafford Park Road.

Mildenhall.—Houses (60), on the Field Road estate; R.D.C. surveyor, Council Offices, Mildenhall, Bury St. Edmunds.

Newark.—Out-patients' department at General Hospital; E. Coleman, Ltd., Balderton, near Newark.

Newcastle-on-Tyne.—Proposed nursery schools (40); G. Kenyon, city architect, 18, Cloth Market.

Northumberland.—Pithead baths at Hartford for the National Coal Board; R. W. Bell & Co., Ltd., builders, Jesmond, Newcastle-on-Tyne.

Norwich.—Houses (149), on the South Tuckswood estate; city architect, City Hall.

Nottinghamshire.—Secondary schools at Beeston, Southwell, Sutton-in-Ashfield, and West Bridgford, and junior school at Worksop (1953-54); county architect, Trent Bridge, Nottingham.

Otley.—New police divisional headquarters (£60,000), 1953-54 programme; county architect, Wakefield.

Peterlee (Durham).—Houses (180) in Howletch Lane for Peterlee Development Corporation, Shotton Hall, Castle Eden; own architects.

Rawdon (Yorks).—Crematorium; Charlton & Crowther, architects, 21, Bond Street, Leeds.

Reading.—Houses (56), Bath Road; Francis Bros., Ltd., Tilehurst Road.

South Shields.—Physiotherapy department and children's block at the General Hospital for the Regional Hospital Board (£18,000); Milton Swales, Ltd., builders, Imeary Street, South Shields.

Stourbridge.—New out-patients' department at Corbett Hospital; D. A. Goldfinch, architect to Regional Hospital Board, 10, Augustus Road, Birmingham.

Sunderland.—Large oil depot and distribution centre at Hendon for the Vacuum Oil Co., Ltd.; Purdie Lumsden & Co., Ltd., general contractors, Newcastle-on-Tyne.

Surbiton.—Additional works; R. W. Windsor, Ltd., Leatherhead Road, Chessington.

Torquay.—Houses (119), on the Sherwell Valley estate; borough surveyor, Town Hall.

Wakefield.—School (240 places), at Kettlethorpe; city engineer, Town Hall.

West Bromwich.—Proposed Churchfields Secondary School; Sheppard & Partners, architects, London.

Windermere.—Houses (180), and 20 flats, on the Droomer Stile estate; Middleton & Jones, architects to U.D.C., 1, Queen Street, Lancaster.